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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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74-1777. Lowe, D. A.; Stiles, A. R. (Editorial Services, World Health Organization, 1211 Geneva 27, Switzerland). **Pesticides: Nomenclature, specifications, analysis, use, and residues in foods.** *Bull. WHO 49(2): 169-204; 1973.* (82 references)

This paper provides a comprehensive guide to international and certain other organizations involved in activities related to pesticides and to the standards they have established and the recommendations they have made. Particular attention is given to nomenclature (including international standard common names), specifications, and methods for the analysis of pesticides and of their residues in foods. The application of pesticides (including recommended methods and specifications for equipment), recommended limits for pesticide residues in foods, and the detection of resistance to pesticides are also covered. Within these areas, where appropriate, both public health and agricultural aspects are covered. (Author abstract by permission)

74-1778. Antongiovanni, E. (Author address not given). **Criteri utile per una limitazione degli effetti negativi derivabili all'ambiente naturale a seguito dell'applicazione di insetticide in agricoltora. [Criteria useful for limiting the negative effects from agricultural insecticides on the natural environment.]** *Contrib. Ist. Ric. Agr. Milan 11: 43-46; 1972.* (7 references) (Italian)

Possible ways of iimiting the negative effects of agricultural insecticides on the natural environment in general, and on arthropods in particular, are outlined. Renewed, and even intensified, attacks by phytophagous populations have occurred in cultures after the application of insecticides due to the destruction of entomophagous species, natural enemies of the phytophaga to be controlled. To minimize the negative effects deriving from the use of insecticides pesticides should be used only if absolutely necessary, and be applied at a time when the insects to be controlled are most sensitive to the particular insecticide. When a choice between insecticides is possible, the one with minimum persistence on the plants should be preferred. Insecticides should be applied at the expenditure specified for them.

74-1779. Pimentel, D. (Cornell Univ., Dept. Entomol., Ithaca, NY). **Pesticides, pollution, and food supply.** *Environ. Biol. 1: 1-38; 1972.* (90 references)

Five percent of the total crop acres in the United States receives insecticide treatment; about half of the amounts used are applied to cotton and tobacco crops. Despite the amounts of insecticide used, crop losses due to insects are increasing; the loss rate is now about 13%. These trends are partially due to the practice of substituting insecticides for sound bioenvironmental pest controls and partially due to higher consumer standards. If pesticides were not used, crop losses would increase 7%; most foods would not be affected by discontinuing the use of pesticides. Pesticides should not be eliminated, but used only when needed. Aircraft spray drift should be minimized, sound bioenvironmental controls reactivated, and additional acreages of some crops planted to offset crop losses due to pesticide reduction. Pesticides are most hazardous to those who apply them. Available data on the long-term, low-level effects of pesticides on public health are inconclusive. Existing levels of pesticide pollution have resulted in the deaths of beneficial insects, fishes, and birds. A systems approach to pest management, in which pests, crop culture, costs, benefits, and risks to environment and health are evaluated should be instituted to meet the needs of agriculture and society.

74-1780. Canuti, A. (Lab. Chim. Prov., Cremona, Italy). **Contaminazione da mercurio del pesce e di alti prodotti alimentari. Nota 2. Aspetti tossicologici del problema. [Mercury pollution of fish and other food products. Part 2: Toxicologic aspects of the problem.]** *Ind. Aliment. (Pinerolo, Italy) 12(11): 97-100, 1973.* (39 references) (Italian)

The toxicological aspects of mercury pollution in food products, especially in fish, are discussed. The toxicological aspects of atmospheric pollution from mercury are also considered. Mercury poisoning is directly related to the time of exposure, the most affected organs being the liver and kidneys, followed by the digestive tract and the brain. The danger of mercury contamination and poisoning through the food chain and a polluted atmosphere especially in working environments should be emphasized. Atmospheric pollution is due to the formation of volatile organic mercury compounds such as methyl, phenyl, and ethyl mercury formed by action of microorganisms.

74-1781. Anonymous. **Pesticides and public health.** *Indian J. Public Health 16(3): 105-106; 1972.*

Pesticides, in particular DDT, have been instrumental in saving millions of lives yearly from malaria, typhus, plague, and other vector borne diseases. Pesticides have also helped achieve sufficient quantities of food grains and have contributed indirectly to the national economies of underdeveloped countries. However, unplanned and uncontrolled use of pesticides contributes to food, water, air, and soil pollution, ecological imbalance, and human health hazards. These stem from the persistence of the most common chlorinated hydrocarbon insecticides, the growing resistance among insects to many insecticides, and the uncontrolled use of pesticides for agronomic practice. The WHO has tested 1400 compounds as alternate insecticides and has investigated alternative methods of vector control. Elaborate precautionary measures have been introduced in all developed countries using pesticides to minimize the hazards. In India, the Government has passed the Insecticide Act to regulate the import, manufacture, sale, transport, distribution, and use of pesticides. Constant sur-

veillance by public health workers is needed to protect the public from toxicities and to minimize other potential hazards.

74-1782. Smittle, B. J.; Clark, P. H.; Cole, M. M. (Insects Affecting Man Res. Lab., Agr. Res. Serv., U. S. Dept. Agr., Gainesville, FL 32604). **Use of radioisotopes to detect food-coated dichlorvos in cotton rat burrows.** *J. Econ. Entomol. 67(1): 67-68; 1974.* (2 references)

Three gamma emitting radioisotopes, ^{24}Na, ^{131}I, and ^{140}La, were put into plastic or aluminum containers and sealed inside wood or dichlorvos blocks that were coated with laboratory chow. When these blocks were taken into burrows by cotton rats, *Sigmodon hispidus* (Baird), they could be detected with 3 portable instruments. (Author abstract by permission)

74-1783. Shukla, S. S.; Leland, H. V. (Univ. Illinois, Urbana-Champaign, IL). **Heavy metals: a review of lead.** *J. Water Pollut. Contr. Fed. 45(6): 1319-1331; 1973.* (113 references)

The impact of lead on water pollution is reviewed in terms of lead toxicity, sources of lead pollution, and the concentrations of lead from various sources in the atmosphere, hydrosphere, and lithosphere. One source of lead pollution is the use of pesticides containing lead compounds. The use of insecticides such as lead arsenate has declined considerably over the years. In 1944, 85.5 million lb were produced in the U.S., but usage declined to about 6 million lb by 1966. Increased concentrations of lead in plants were attributed to lead arsenate treatment of soils as early as 1945. None of the unsprayed soils examined contained more than 15 mg/kg of lead, whereas the lead contents of orchard soils sprayed with lead arsenate were 40-100 mg/kg.

74-1784. Anonymous. **[Proposal for publishing the results of pesticide residues on foods in commercial newspapers.]** *Nogyo Gijutsu (J. Agr. Sci.) 29(2): 73; 1974.* (Japanese)

The pesticide residue tolerance systems in the United States and Japan are described. The data published by the Japanese Ministry of Health and Welfare on actual residues on agricultural crops in 1964 and 1965 is provided. A system is proposed for the regular publication of the results of pesticide residue determination on fruits, vegetables and staples such as rice, barley, and wheat produced domestically or imported in commercial newspapers. The system would allow consumers to eat without worry, farmers to produce and sell without delays, international trade to contract with self-confidence, and an administrator to work with definite programs. The system will also be effective for the Food Hygiene Act (establishing the residue standard) and for the application standard of the Ministry of Agriculture and Forestry to ensure the safety of foods.

74-1785. Deoras, P. J. (Sahitya Sahawas, Bandra-East, Bombay, India). **Five hundred million years of life at stake?** *Pesticides 6(8): 23-31; 1972.* (18 references)

The rapid increase in human population and the rising level of expectation have resulted in environmental degradation and threats to the earth's ecological balance. Pesticides have offered numerous benefits such as control of malaria, typhus, and plague, but their misuse has resulted in harmful effects to man and wildlife. Residues of DDT in oysters have been reported to exceed the permissible level of 0.01 ppb by 70,000 times. In Bombay, India, an average of 23 deaths per month occurs due to suicide by diazinon ingestion. Frogs and snakes, important predators of crabs and insects which damage rice paddies, have been destroyed by agricultural pesticide spraying. Reproductive impairment by organochlorines has been demonstrated in the case of predatory birds and hypothesized for man. Biological controls may offer an alternative to pesticide use.

74-1786. Rajendra, M. K. (NOCIL, Bombay, India). **Do pesticides really pose a threat to agriculture?** *Pesticides 6(10): 26-27; 1972.*

On the premise that pesticides are despoiling the environment and threatening the balance of nature, environmentalists are pressing for legislation to outlaw DDT which has been most effective in eradicating malaria from many countries, notably India. No other chemical has seemed as promising as DDT in continuing to control this disease. For crop protection techniques other than chemical control are not acceptable to the present day farmer. Many believe that if pesticides are not used in agriculture, the world will be faced with starvation. Confusion concerning pesticides in the environment has resulted from the improvements that have been made in recent years in chemical analysis. Highly sensitive gas chromatographic techniques can give misleading results, particularly in the hands of inexpert operators who may misread values. The Indian government has decided to continue the use of DDT in light of the economic and health benefits. If the use of pesticides were banned in the United States, crop losses would reach 50% and food prices increase 4 to 5 fold. While pesticides should be used, their use must allow for the safety of man, wildlife, and the natural environment.

74-1787. Anonymous. **Whither pesticides -- DDT first of the dominoes to fall.** *Pesticides 6(10): 28-29; 1972.*

Excerpts from the 1971 McDougall Memorial lecture presented by Norman Borlaug are discussed in relation to pest control problems in India. Because of the agricultural and public health benefits offered by DDT, the Indian Government has decided to permit DDT use to continue until an economical and effective substitute has been found. The "privileged environmentalist lobby" is charged with spreading hysteria

about chemical poisoning, and about the supposed carcinogenicity of DDT.

74-1788. Polikarpov, G. G.; Kulebakina, L. G.; Tsitsugina, V. G.; Andrudtschenko, V. V. (Acad. Sci. UkSSR, Inst. Biol. Southern Seas, Sevastopol, USSR). **Radioecology and chemoecology in the service of the protection of nature.** *Proceedings of the International Symposium on Radioecology Applied to the Protection of Man and his Environment (Rome, 1971), Vol. 1, pp. 773-777, May 1972.* (14 references)

Radiation and chemical ecology deal with ecological processes occurring in the biocenosis as they interact with factors in the external milieu such as chemicals and radioactive substances. DDT and its derivatives are widespread throughout the biosphere. The concentration of DDT in molluscs and fishes taken from waters off England, Scotland, California, and Canada averages 0.1 to 0.2 ppm. The concentration in organisms taken from the Baltic Sea is higher. The DDT level of Black Sea organisms (0.1 to 0.2 ppm) is similar to that found in hydrobionts in other seas and oceans. Hydrobionts are highly sensitive to chlororganic pesticides. DDT concentrations of 0.1 mg/l are lethal to the unicellular alga *Chaetouros curvisetus*, while the lethal concentration for the crustacean *Leander adspersus* is only 0.01 mg/l. The growth of electronuclear power and the chemical industry necessitates the use of radioecology and chemoecology for the protection of the environment.

74-1789. Sharman, R. S. (Author address not given). **Los pesticidas y la sanidad pecuaria. Un analisis de algunos de los beneficios y de los problemas vinculados con el empleo de pesticidas en la produccion pecuaria en el hemisfero occidental. [Pesticides and animal health. An analysis of some benefits and problems involved in the use of pesticides in livestock farming in the western hemisphere.]** *Rev. Vet. Venez. 32(190): 336-359; 1972.* (8 references) (Spanish)

General problems, benefits, and disadvantages involved in the use of pesticides in animal production in the western hemisphere in general and in Latin America in particular are discussed. Organochlorine pesticides, especially DDT, are of major importance in livestock farming, but also in the control of malaria and other diseases in underdeveloped countries. DDT has a relatively low acute toxicity, but like other organochlorine pesticides, accumulates in animals, especially in fatty tissues. Contrary to some views, DDT is not considered a carcinogen. An extensive food analysis program conducted in the United States between 1966 and 1968 revealed residues of 15 different organochlorine pesticides, 6 organophosphorus pesticides, 4 herbicides, and 2 carbamates in food samples. Dieldrin, DDT, and chloromethylphenoxyacetic acid residues in imported meat products were usually at or below 0.1 ppm. Special education in veterinary institutions and training of workers handling and applying pesticides, as well as studies on the possibility of using other methods of pest control, are necessary for reducing pesticide residue levels in food products.

74-1790. Cerna, V.; Benes, V.; Berankova, J.; Dirlbek, J. (Inst. Hygiene and Epidemiology, Prague, Czechoslovakia). **Residua nekterych insekticidu po pudni desinsekci. [Residues of some insecticides after soil disinsection.]** *Agrochemia (Bratislava) 13(12): 351-354, 1973.* (22 references) (Czech)

Three successive annual crops of carrots and potatoes were grown in soils treated with various insecticides at the rate of 3 kg active material per 10,000 m^2. The insecticide residues in the crops and in the soil were determined by chemical analysis after solvent extraction and also by Bakuniak's biological test using fruit flies (*Drosophila melanogaster*). The residues in carrots were generally 2-3 times higher than in potatoes. In carrots, lindane (80% active material) left 0.8 to 1.5 mg/kg, heptachlor (8%) left 0.5 mg/kg, trichloronate (7.5%) left only slightly less residue (0.13-0.45 mg/kg), and diazinon (10% active material) left only 0.08 mg/kg in the first crop; the residues for the second crop were 0.35, 0.40, 0.13 and 0.03 mg/kg. In potatoes, heptachlor left the highest first-year residue (0.17 mg/kg), followed by trichloronate (0.11 mg/kg), lindane (0.06 mg/kg) and diazinon (0.02 mg/kg). The second-year data followed the same order. The third-year results were below the detectable level (<0.02-0.05 mg/kg). Overall the results indicate that for toxicological reasons organophosphates (diazinon) are preferable to chlorinated hydrocarbons because their residues are lower by an order of magnitude.

74-1791. Johnston, D. W. (Univ. Florida, Gainesville, FL). **Persistent pesticides in post-migratory birds from Grand Cayman Island.** *American Philosophical Society Year Book, pp. 316-318, 1973.*

The pesticide residues in the adipose tissue and brains of southbound migrating birds representing five species of warblers were determined; 1 month later, the residues in feral individuals of the same species living 800 miles south on Grand Cayman Island were determined. Small quantities of mirex and dieldrin were detected only in the adipose tissue of the southbound migrants. An average of 10.4 ppm total DDT was found in the adipose tissue of the migrants, compared with 7.5 ppm in the Grand Cayman birds; the DDT residues increased between the premigratory and postmigratory samples of one species. The DDT residues in the brains of the migrating birds averaged 8.8 ppm, while the residues in the brains of the Grand Cayman birds averaged 1.4 ppm; in no species did the residues increase between the premigratory and postmigratory samples. The brain DDT levels in premigratory *Dendroica palmarum* are approaching the lethal level in that species. The results indicate that during lipid utilization of small migratory birds in flight, DDT is not further concentrated in the remaining adipocytes or translocated to nervous tissue.

74-1792. Guray, O. (Ankara Univ. Tip Fak., Ankara, Turkey). **Yeni ekolojik sartlarda pestisitler tehlikesi. [Pesticide dangers: new ecologic factors.]** *Ankara Univ. Tip Fac. Mecm. 24(5 Suppl. 51): 3-30; 1971.* (32 references) (Turkish)

In Turkey as in other countries, the persistent organochlorine insecticides are being increasingly replaced by organophosphates and carbamates. Samples of fruits treated with organophosphates were examined by thin-layer chromatography. Two-thirds of the apple samples investigated contained 0.02-0.025 ppm of folidol E-605 (parathion), and more than half of the apples contained 0.03-0.05 ppm gusathion (azinphosmethyl) after the prescribed waiting period had elapsed. All six peach samples examined contained 0.025 ppm of parathion or more, and 4 of 6 peaches contained 0.02-0.03 ppm gusathion. When a different parathion preparation (Fosferno 20) was used, residues were 0.010-0.025 ppm in 8 of 10 pear samples; diazinon residues were approximately 0.005 ppm in 2 pears and undetectable in 2 more. All 6 apricot samples examined contained parathion residues (0.015-0.025 ppm), and 4 of 6 apricot samples contained 0.005-0.002 ppm of diazinon. Plums contained 0.005-0.025 ppm parathion, and 7 of 11 plums contained 0.02-0.05 ppm gusathion. The high incidence of residues in excess of the WHO standards is attributed to carelessness on the part of spray applicators.

74-1793. Huschenbeth, E. (Institut fuer Kuesten- und Binnenfischerei, Bundesforschungsanstalt fuer Fischerei, Hamburg, Germany). **Zur Speicherung von chlorierten Kohlenwasserstoffen im Fisch. [Accumulation of chlorinated hydrocarbons in fish.]** *Arch. Fischereiwiss. 24(1-3): 105-116; 1973.* (7 references) (German)

Specimens of fish, crustaceans, and bivalves were analyzed to determine the accumulation of DDT, TDE, DDE, lindane, dieldrin, and PCBs. Most of the investigated lean fish from the North Atlantic, the North Sea and the Baltic had accumulated less than 0.1 ppm DDT and DDT metabolites. In fat fish, the residue levels were higher, usually not exceeding 1 ppm. Higher values were determined only for salmon. The PCB residue levels in fish from the North Sea were 0.2 ppm in lean fish and 1.3 ppm in fat fish. Cod liver samples from the central Baltic contained up to 57 ppm total DDT, and average values of about 30 ppm were determined. During the sterilization of cod liver, DDT content decreased, TDE greatly increased and total DDT decreased. The total DDT level in cod-liver was reduced by more than 50% during cooking and by 10% during drying. Freshwater fish from the rivers Moselle, Elbe, Aller, and Trave had a considerably higher contamination by DDT and its metabolites. Some values came up to 6 ppm. Most of the fish species, however, accumulated less than 1 ppm. The PCB level was slightly higher in freshwater fish than in saltwater fish.

74-1794. Lewis, T. (Commonwealth Inst. Biol. Control., Curepe, Trinidad). **Aerial baiting to control leaf-cutting ants (*Formicidae, Attini*) in Trinidad. II. Field application, nest mortality and the effect on other animals.** *Bull. Entomol. Res. 63(2): 275-287; 1973.* (10 references)

Effects of aerial baiting against leafcutting ants on other fauna were examined in a trial of a bait containing aldrin, soybean oil, and citrus meal. The number of specimens of an insectivorous lizard, *Cnemidophorus lemniscatus*, decreased immediately after baiting, but returned to normal in 2 months; the decrease may have been a natural response to the dry season. Adults present during baiting later bred successfully. Lizard livers and brains collected 5 weeks after baiting at an excessive level contained 0.03 ppm aldrin and 1.8-2.2 ppm dieldrin; dieldrin levels dropped to ca. 0.1 ppm by 12 weeks and 0.01 ppm by 40 weeks after treatment. Land crabs living in an area accumulating bait leachate showed only the normal seasonal population fluctuations. Crab tissues contained only traces of aldrin and dieldrin; the stellate ganglion contained significantly more aldrin-dieldrin than the liver. A single application of bait toward the end of the dry season would probably provide adequate ant control.

74-1795. Hesselberg, R. J.; Scherr, D. D. (Fish-Pesticide Res. Lab., U. S. Bureau Sport Fisheries Wildlife, Columbia, MO 65201). **PCB's and *p,p'*-DDE in the blood of cachectic patients.** *Bull. Environ. Contam. Toxicol. 11(3): 202-205; 1974.* (13 references)

The effect of severe stress on the levels of lipid-soluble organochlorine compounds in the venous blood was studied by analyzing samples from nine patients hospitalized with severe wasting diseases and 15 healthy controls. The concentrations of DDE residues in the blood were much higher in the patients (21 ppb average) than in the nonpatients (3 ppb average). PCBs were detected only in the patients (47 ppm average). None of the patients complained of nervous system symptoms. The DDE levels in the blood of the cachectic patients were much lower than those in the blood of apparently healthy workers in a DDT formulating plant. While it would be difficult to show that the relatively low level of DDE in the blood had any effect on the patients, the PCB concentrations may have been high enough to be harmful.

74-1796. Kuhr, R. J.; Davis, A. C.; Bourke, J. B. (New York State Agr. Exp. Sta., Geneva, NY 14456). **Dissipation of guthion, sevin, polyram, phygon and systox from apple orchard soil.** *Bull. Environ. Contam. Toxicol. 11(3): 224-230; 1974.* (8 references)

Every 2 weeks, beginning before the first spray of the season until well after harvesting, core soil samples were taken from a commercial apple orchard (D) in upstate New York. Various pesticides including phygon, polyram, systox (demeton), guthion (azinphosmethyl), and sevin (carbaryl) were applied during the sampling period. Soil samples were also removed from an experimental orchard (12A) which was treated with guthion and sevin. Guthion was found in a maximum concentration of 1.6 ppm in the top 2 inches only of orchard D; within a month after the last application guthion residues in the soil fell below detectable limits. In the experimental orchard two months was required for most of the guthion to disappear from the soil. No sevin was detected in any of the soil samples, indicating that it disappeared from the soil within a matter of days. Varying amounts of phygon were detected in the top 6 inches of the commercial orchard; most of the fungicide was altered within one year. Polyram residues accumulated in the top 2 inches of soil up to a maximum of 6 ppm. This pesticide proved to be highly unstable in the soil. Systox appeared to be unstable in the orchard soil and failed to persist from one season to the next. Thus, the newer organophosphorus and carbamate pesticides appear to be less serious pollutants of orchard soil than do compounds such as DDT and lead arsenate.

74-1797. Hawthorne, J. C.; Ford, J. H.; Loftis, C. D.; Markin, G. P. (P.O. Box 989, Gulfport, MS). **Mirex in milk from Southeastern United States.** *Bull. Environ. Contam. Toxicol. 11(3): 238-240; 1974.* (7 references)

One quart milk samples from cows which had grazed in areas treated with mirex were obtained from the storage tanks of dairy or processing plants in Mississippi, Florida, Georgia, Louisiana, and South Carolina. Of the 60 samples analyzed, none had mirex residues at the existing level of detection (0.3 ppb). Many of the samples did, however, show small but questionable peaks at the retention time for mirex; attempts to confirm these peaks were inconclusive. Thus, milk coming from cattle grazed on mirex treated areas may contain extremely minute quantities of mirex, the amounts being so small that they are at least 100 times lower than the presently established tolerance levels for milk.

74-1798. Leistra, M.; Smelt, J. H. (Lab. Res. Insecticides, Wageningen, The Netherlands). **Concentrations of quintozene at different depths in bulb-growing soils.** *Bull. Environ. Contam. Toxicol. 11(3): 241-243; 1974.* (5 references)

Soil samples were taken from six fields near three different settlements in the bulb areas of the Province of North Holland; layers to a depth of about 140 cm were sampled. Significant amounts of quintozene were found in the layer from 0 to about 40 cm, while smaller but still easily detectable amounts were found in the 40 to 70 cm layer. The distribution in the top 40 cm was mainly due to mechanical working of the soil, and the distribution in the 40 to 70 cm layer could have resulted from some diffusion and leaching. Chromatographic transport was unimportant. No quintozene was detected at depths greater than 70 cm.

74-1799. Addison, J. B.; Silk, P. J.; Unger, L. (Dept. Chem., Univ. New Brunswick, Fredericton, N.B., Canada). **The photochemical reactions of carbamates II. The solution photochemistry of matacil (4-dimethylamino-*m*-tolyl-*N*-methyl carbamate) and landrin (3,4,5-trimethylphenyl-*N*-methyl carbamate).** *Bull. Environ. Contam. Toxicol. 11(3): 250-255; 1974.* (9 references)

The photochemical behavior of matacil (aminocarb) and landrin was observed following irradiation with $\lambda > 300$ nm in aerated and degassed ethanol and cyclohexane solution. The major photodecomposition product of matacil under all conditions was 4-dimethylamino-3-methyl phenol. Trace quantities of other products were also observed. The major photodecomposition product of landrin was 3,4,5-trimethylphenol. Samples of the major photodecomposition products of matacil and landrin were synthesized by the alkaline hydrolysis of the corresponding carbamates. In each case, the spectra obtained were identical to those of the phenols extracted and/or separated from the photolyzed solutions. The photoproduct of matacil does not correspond to any of the degradation products observed when the pesticide is sprayed on bean foliage and exposed to ultraviolet light. The major photoproduct of landrin is detected as a metabolite in living mice but is not found as a photoproduct on growing bean foliage. The photolysis of carbamates probably proceeds via a photo-Fries mechanism.

74-1800. Hawthorne, J. C.; Ford, J. H.; Markin, G. P. (P.O. Box 989, Gulfport, MS 39501). **Residues of mirex and other chlorinated pesticides in commercially raised catfish.** *Bull. Environ. Contam. Toxicol. 11(3): 258-264; 1974.* (5 references)

Samples of commercially raised catfish, catfish food, sediment, and water from several catfish ponds in the Southwestern United States were analyzed for residues of mirex and other chlorinated pesticides. The samples were taken from areas which had been treated with mirex, as well as from untreated areas. Mirex was found in none of the 50 samples at the detection level (0.01 ppm). However, all samples from both areas contained extensive residues of other pesticides: DDT and its analogs were found in all samples (1.64 ppm average); toxaphene was found in 96% of the samples (1.98 ppm average); dieldrin was found in 90% of the samples (.07 ppm average); endrin was found in 76% of the samples (0.05 ppm average); aldrin was found in 6% of the samples; and chlordane was found in one sample. None of the samples contained heptachlor or heptachlor epoxide.

74-1801. Rahman, A.; Ashford, R. (Crop Sci. Dept., Univ. of Saskatchewan, Saskatoon, Saskatchewan, Canada). **Persistence of trifluralin under field conditions in Saskatchewan.** *Can. J. Plant Sci. 53(2): 421-423; 1973.* (8 references)

Trifluralin was sprayed on the soil surface of Saskatchewan plots at 1.12 or 2.24 kg/ha in June, 1969. Soil samples were collected over 2.5 cm depth ranges from 0.10 cm at 2-week intervals, June-Sept. 1969 and May-Sept. 1970. Trifluralin residues were estimated by a bioassay method using the sensitive plant, German millet. By the end of the 1969 growing season the top 5 cm of soil still contained enough active trifluralin to kill the test plants. The concentration of herbicide started to decline rapidly after June 1970, and by August 1970, had decreased to a level without effect on the test plants. The samples collected from the 5-10 cm depths in 1969 contained no detectable trifluralin, but significant amounts were present at this level at the beginning of 1970. The level had declined to below the detectable amount by the end of the 1970 growing season. Tests on plots with growing crops gave similar results.

74-1802. Wilson, D. M.; Oloffs, P. C. (Pestology Cent., Dept. of Biol. Sci., Simon Fraser Univ., Burnaby 2, British Columbia, Canada). **Residues in plants grown in soils treated with the experimental insecticide Velsicol HCS-3260.** *Can. J. Plant Sci. 54: 203-209; 1974.* (16 references)

A study was conducted with the experimental high-purity chlordane insecticide Velsicol HCS-3260 (high-purity chlordane) to determine translocation of residues into plants grown in soils previously treated with the compound. Levels of parent compound and metabolites were determined in the edible portions of vegetable crops and alfalfa for two growing seasons after application to soils at 5.6 and 11.2 kg of active ingredient per hectare, June 1971. Residue levels in the vegetable crops were: radishes $\geqslant$ potatoes $\geqslant$ carrots $\geqslant$ beans. Crops grown in soils treated at the lower rate contained correspondingly lower residue levels. In 1972, levels in the root crops reflected the decrease of those in the corresponding soils. Beans, however, contained the same residue levels in both years. The aerial parts in alfalfa contained, in addition to α- and γ-chlordane, the metabolites photo-α-chlordane and oxychlordane. The latter may have been formed within the plants via the intermediate 1,2-dichlorochlordene, whereas the former may have been translocated from the soil. (Author abstract by permission)

74-1803. Boval, B.; Smith, J. M. (Univ. California, Davis, CA). **Photodecomposition of 2,4-dichlorophenoxyacetic acid.** *Chem. Eng. Sci. 28(9): 1661-1675; 1973.* (26 references)

Three types of reactor operation (flow differential, flow integral, and batch recycle) were used to study the kinetics of the photolysis and oxidation of 2,4-D. The initial reaction rate was proportional to the light absorbed and independent of the 2,4-D and dissolved oxygen concentrations. Using thin-layer chromatographic and spectroscopic analytical methods, 2,4-DCP

was identified as one of the photolysis products. The initial rate and rate at finite conversions for 2,4-DCP were consistent with a rate equation based on a photodeactivation process followed by the formation of peroxides. Various intermediates, notably 2,4-DCP, had an autocatalytic effect on the rate of disappearance of 2,4-D. Carbon dioxide was produced as the final oxidation product when 2,4-D or 2,4-DCP was the reactant. The data indicated that the aromatic ring was ruptured, suggesting that photochemical oxidation could be employed for reducing refractory, aromatic pollutants to fragments more susceptible to biological oxidation.

74-1804. McKenry, M. V. (Univ. California, Riverside, CA 92507). **The behavior of pesticides containing 1,3-dichloropropene and 1,2-dibromoethane in soils.** *Diss. Abstr. Int. 34(7): 3034B; 1974.*

The movement of two fumigant-type pesticides, Telone and EDB, was studied in field and laboratory situations using gas sampling techniques and gas chromatographic analysis. High soil moisture content is an important factor limiting diffusion: the fumigants partially dissolve in the soil water, thus affecting the soil vapor phase concentration. Soil porosity (blockage of air passageways), soil temperature (hydrolysis rate), and organic matter content affect fumigant dispersion. In a sandy loam and a silty clay loam, EDB did not degrade appreciably during a two-week period. Mass flow of toxicants does occur for the first few days after fumigation, especially in dry soils. Hydrolysis is an important factor in removal of 1,3-dichloropropene from warm soils, whereas EDB and 1,2-dichloropropane are more persistent. Diffusion is the primary means of dissipation of the latter two substances. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-32,691.)

74-1805. Witkonton, S. (Pennsylvania State Univ., State College, PA 16802). **Fate of the pesticide *N'*-(4-chloro-*o*-tolyl)-*N,N*-dimethylformamidine in fruit and soil, and toxicological properties of some of its conversion products.** *Diss. Abstr. Int. 34(8): 3831B; 1974.*

Radiotracer analyses of apples treated with chlordimeform revealed disappearance from the surface; less than 1% of the applied chemical remained on the surface at harvest (60 days posttreatment). The 25% of the applied chemical recovered in apple peel and pulp mainly comprised the parent compound and 4′-chloro-*o*-formotoluidine. Approximately 10% of the chlordimeform applied to Hagerstown silt loam soil was still detectable 500 days after application. Chlordimeform did not readily leach or accumulate in deeper soil layers. Less than 20% of the applied chlordimeform was degraded to 4-chloro-*o*-toluidine; this chemical was more persistent than the parent compound. Soil microbial action or sunlight exposure converted chlordimeform through 4 chloro-*o*-toluidine to 4,4′-dichloro-2,2′-dimethylazobenzene. The acute oral LD50 of 4′-chloro-*o*-formotoluidine and 4-chloro-*o*-toluidine were 2030 and 490 mg/kg respectively; the LD50 of 4,4′-dichloro-2-2′-dimethylazobenzene was greater than 9300 mg/kg. Rats eliminated 94% of the orally administered dose of 4′-chloro-*o*-formotoluidine in 72 hr. No evidence of tumorigenicity was noted. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-4304.)

74-1806. Best, J. A. (North Carolina Univ. at Raleigh, Raleigh, NC 27607). **The effect of soil pH on *s*-triazine dissipation using a balance-sheet approach.** *Diss. Abstr. Int. 34(9): 4155B; 1974.*

The effect of soil pH on the dissipation of ^{14}C ring-labeled atrazine, hydroxyatrazine, and prometryne were studied over a 5-month period under greenhouse conditions. The soil used in this study was a Bladen silt loam (8% O.M., pH 5.5) and modified to pH 7.5 by liming. Employment of an "integrated system" allowed simultaneous monitoring of degradation, volatilization, respiration, plant uptake and leaching processes. A resulting balance-sheet indicated that a range of 87 to 99% of the ^{14}C added could be accounted for after 5 months. Degradation was found to be the primary mode of dissipation. Atrazine degradation was attributed to non-biological processes, while prometryne was apparently altered by microbial action. Hydroxyatrazine was the major isolate from the atrazine treatments while prometryne yielded an unknown and hydroxypropazine. Extractable atrazine after 5 months amounted to 35% of the initial amount added in the pH 7.5 soil and 11% at pH 5.5, while prometryne occurred at 10% in the pH 7.5 soil and 42% at pH 5.5 with respect to that initially applied after 5 months. Plant uptake and leaching occurred to a greater extent in the more alkaline soil with each chemical, but these pathways along with volatilization and respiration were minor contributors toward the dissipation of these chemicals. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 74-5467)

74-1807. Impson, J. W. (Louisiana State Univ. and Agr. and Mechanical Coll., Baton Rouge, LA 70803). **Relationship of patterns of use of DDT and its residues in animal feeds and food products.** *Diss. Abstr. Int. 34(9): 4424B-4425B; 1974.*

Herd milk samples from four dairies in a cotton-growing area of Northeast Louisiana contained DDT at 1.60-6.00 ppm (fat basis). All the dairies practice a combination of dry lot and pasture feeding. A positive correlation was found between the seasonal use of DDT on cotton and maximum levels of DDT in herd milk of each dairy. Corrected mean residue values for dairy A increased from 1.38 ppm in May to 5.54 ppm in September; dairy B, 0.80 ppm in May to 3.77 ppm in

November; dairy C, 1.45 ppm in June to 9.90 ppm in October; and dairy D, 0.39 ppm in June to 2.42 ppm in August. Hay, silage, and pasture grass were highly contaminated with DDT, presumably as a result of DDT drift from adjacent cotton fields. DDT residues in hay ranged from 0.17 to 28.67 ppm, and averaged 5.24 ppm. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 74-7228.)

74-1808. Kondo, M. (Faculty of Pharmacy, Osaka Univ., Toyonaka, Osaka, Japan). **[Mercury content of animal and vegetable foods.]** *Eisei Kagaku (J. Hyg. Chem.) 20(2): 47-66; 1974.* (11 references) (Japanese)

Mercury contents were determined in agricultural crops including rice, vegetables and fruits, in fish and shellfish, meats, eggs, milk and dairy products, and processed foods. By estimating the average amount of food intake of the Japanese people, an average daily intake of 44 micrograms of total mercury and 2.18 micrograms of methyl mercury per day per head was calculated. The mercury content of rice has decreased largely because of the ban on organomercurial fungicides, on the average of 0.055 ppm. However the intake of mercury from rice per day is largest (17.7 micrograms), because of the amount of rice consumed, 322 g/day. However although there is a relatively large content of mercury in fish, the quantity of fish eaten differs widely and is a major factor in total mercury intake.

74-1809. Heinisch, E. (Abteilung Chemische und Toxikologische Forschung, Biologische Zentralanstalt Berlin, Kleinmachnow, DDR). **Zur Kontamination von Gewaessern mit Bioziden. [Biocide contamination of waters.]** *Fortschr. Wasserchem. Ihrer Grenzgeb. 14: 151-158; 1972.* (17 references) (German)

Studies on the contamination of water, soil, and aquatic organisms with biocides are reviewed. Fat samples from *Leptonychotes weddelli* caught in the Antarctic contained 0.04-14 ppm DDT, and specimens of *Trematomus bernacchii, Tr. hansoni*, and *Rhigophilia dearborni* caught at 500 m depth contained up to 0.44 ppm DDT. Photosynthesis was reduced in algae and plankton when DDT was present in sea water in the ppb range. The contamination of water bodies may be due to intentional application of pesticides, such as 2,4,5-T, urea derivatives, DDT, toxaphene, and organomercurials, but also to entrainment and leachout from treated farmlands. Following aerial application, the DDT residue level was higher in the 5-15 cm soil layer than in the surface layer, and the residue concentrations with depth up to 50 cm hardly decreased. These findings are indicative of the potential contamination of groundwater by pesticides.

74-1810. Spynu, Ye. I.; Sova, R. Ye.; Stefanskiy, K. S.; Akoronko, S. L. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Model'nyy eksperiment kak osnova dlya izucheniya i prognozirovaniya kinetiki pestitsidov v rasteniyakh. [Model experiment for studying and predicting pesticide kinetics in plants.]** *Gig. Sanit. 39(2): 70-74; 1974.* (8 references) (Russian)

The planning and structure of multifactorial model experiments for the study and the prediction of the pesticide kinetics in plants is presented. The study of the persistence of polychlorocamphene (toxaphene) and rogor (dimethoate) in potato plants as a function of temperature, initial dose, and observation duration is used as an example. The temperatures studied were 4 C, 20 C, and 36 C, while the initial doses were 0.5, 2, and 3.5 mg/kg. The observation duration was 1 day, 4 days, and 7 days. Various combinations of these factors were studied in the model experiment. The magnitude of the polychlorocamphene residues in potato was determined essentially by the initial dose, while the time factor was predominant in the breakdown of rogor. Temperature had no marked effect on the degradation of polychlorocamphene, but considerably influenced the breakdown of rogor.

74-1811. Murza, V. I.; Kurchatov, G. V.; Khasanov, Yu. U. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **K sanitarno-gigiyenicheskoy kharakteristike aviatsionnogo sposoba primeneniya insektitsidno-mikrobnykh smesey. [Sanitary-hygienic characterization of aerial application of insecticide-microbe mixtures.]** *Gig. Sanit. 39(3): 104-106; 1974.* (5 references) (Russian)

The sanitary hygienic assessment of air contamination with carbaryl and *Bacillus thuringiensis* was performed during and after aerial application of a mixture composed of 2 kg biological preparation (30,000,000,000 cells per g) and 0.5 kg carbaryl per ha. The microbe concentrations in the air over the treated field exceeded the background level 42.5 times on the day of application, 22.5 times after one and three days, and 0.9 times after five days. The microbe concentration measured after five days at a distance of 1,000 m from the treated field exceeded the background level by 40%. The carbaryl concentration in the air over the treated field was 0.08 mg/m^3 on the day of application, and 0.13 mg/m^3 after one day; no carbaryl was detectable after three days. The carbaryl concentrations measured at distances of 100 m, 300 m, and 500 m from the treated field during application were 0.08 mg/m^3, 0.04 mg/m^3, and 0.03 mg/m^3, respectively.

74-1812. Takahashi, M.; Nagatoshi, Y.; Kasakawa, H.; Iguchi, H.; Iwami, S.; Fujita, K. (School of Pharmacol., Faculty of Med., Hirosaki Univ., Hirosaki, Aomori, Japan). **[Experimental studies on the persistency of organophosphorus pesticides in the blood.]** *Hirosaki Igaku (Hirosaki Med. J.) 25(4): 537; 1974.* (Japanese)

Rabbits were sprayed daily with a 1000-fold dilution of 40% WP of fenitrothion and 25% WP of salithion, respectively, for 5 hr on three consecutive days. The residual concentration of these organophosphorus pesticide residues in their blood was determined. Both pesticides were detected in the blood just after spraying; however, after 24 hr about 90% of salithion and about 70% of fenitrothion disappeared. Neither could be detected after 10 days. The urinary metabolite of fenitrothion, PNMC, had a disappearance pattern similar to fenitrothion in the blood. From these findings it was presumed that salithion and fenitrothion were promptly excreted from the body with very small persistence.

74-1813. Usutani, S.; Nishiyama, K.; Sato, I.; Kawaguchi, S.; Fujita, K. (School of Public Health, Faculty of Med., Hirosaki Univ., Hirosaki, Aomori, Japan). **[The amount of pesticide exposure and the dynamic state of organophosphorus pesticides in the blood of persons engaging in co-operative pesticide application.]** *Hirosaki Igaku (Hirosaki Med. J.) 25(4): 537; 1974.* (Japanese)

The air inhaled by persons engaging in application of fenitrothion by a speed-sprayer was sampled to determine the amount of pesticide inhaled. The dynamics of organosphosphorus pesticides in the blood and metabolites in the urine were also determined. On the basis of *p*-nitro-*m*-cresol in urine the calculated amount of fenitrothion inhaled was 0.362 ± 0.275 mg/day on the speed sprayer operator and 0.575 ± 0.267 mg/day on the applicator. The pesticide was detected in the blood of all persons who engaged in application immediately thereafter. However, after 12 hr fenitrothion was not detected or detected only in trace amounts in blood from five out of seven persons; after 48 hr it was not detected or detected only in traces. The GOT, GPT and ChE values before and after application showed no conspicuous differences. An examination and improvement of methods in detecting organophosphorus pesticides in blood is needed since GC peaks coincided in blood of persons who have never been exposed to organophosphorus pesticides with the GC peak for organophosphorus pesticides.

74-1814. Baude, F. J.; Pease, H. L.; Holt, R. F. (E. I. du Pont de Nemours & Co., Inc., Biochem. Dept., Exp. Sta., Wilmington, DE 19898). **Fate of benomyl on field soil and turf.** *J. Agr. Food Chem. 22(3): 413-418; 1974.* (8 references)

Benomyl [methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate] degradation to MBC (methyl 2-benzimidazolecarbamate) and AB (2-aminobenzimidazole) and the disappearance of these secondary products were studied in the field on bare soil and turf in four areas of the United States using ^{14}C-labeled and unlabeled parent compound. The half-life of the total benzimidazole-containing residues is about 3-6 months on turf, representing a vegetative situation, and about 6-12 months on bare soil. The major portions of the residues were found in the top 4 in. of soil. (Author abstract reprinted by permission of the American Chemical Society)

74-1815. Jones, A. S.; Hodges, C. S. (Forestry Sci. Lab., Southeastern Forest Exp. Sta., U.S. Dept. Agr., Forest Service, Research Triangle Park, NC 27709). **Persistence of mirex and its effects on soil microorganisms.** *J. Agr. Food Chem. 22(3): 435-439; 1974.* (5 references)

Up to 1 g of mirex per 50 g of soil had no demonstrable effects on total populations of soil fungi or bacteria. The 0.5- and 1.0-g concentrations significantly reduced populations of actinomycetes in one of three soils. A variety of soil fungi and a few bacteria colonized mirex bait but did not degrade the mirex. No degradation of mirex occurred in nine aerobic soils or four anaerobic lake sediments after 6-months incubation, or in liquid cultures of bacteria after 1 month. ^{14}C-Labeled mirex in bait placed outdoors for 6 months remained primarily in the bait particles; only 6.6% was found in the top 15 mm of soil. No mirex leached through the 100 X 110 X 45 mm soil layer with approximately 3 l. of collected rainfall. (Author abstract reprinted by permission of the American Chemical Society)

74-1816. Yaron, B.; Heuer, B.; Birk, Y. (Inst. Soils and Water, Agr. Res. Org., Bet Dagan, Israel). **Kinetics of azinphosmethyl losses in the soil environment.** *J. Agr. Food Chem. 22(3): 439-441; 1974.* (5 references)

The kinetics of azinphosmethyl losses in sterile and nonsterile soil as affected by temperature and moisture content was studied. The fate of azinphosmethyl in soil involved two steps: one after application when the initial concentration remained constant and the second when the disappearance starts and the azinphosmethyl losses follow first-order kinetics. It was found that the lag period before azinphosmethyl losses begin is more than a biological effect. The water and temperature affect both the lag period and the rate of disappearance. (Author abstract reprinted by permission of the American Chemical Society)

74-1817. Alley, E. G.; Layton, B. R.; Minyard, J. P., Jr. (Mississippi State Chem. Lab., Mississippi State, MS 39762). **Identification of the photoproducts of the insecticides mirex and kepone.** *J. Agr. Food Chem. 22(3): 442-445; 1974.* (12 references)

The photolysis of kepone hydrate and the dimethyl ketal of kepone in cyclohexane has been studied. Mass spectral, infrared, and NMR data were used to establish that the monodechlorinated photoproducts are 1,2,3,4,6,7,9,10,10-nonachloro-5,5-

dihydroxypentacyclo[5.3.0.0^{2,6}.0^{3,9}.0^{4,8}]decane for the hydrate and 1,2,3,4,6,7,9,10,10-nonachloro-5,5-dimethoxypentacyclo[5.3.0.0^{2,6}.0^{3,9}.0^{4,8}]decane for the ketal. The chemical conversion of these compounds to the corresponding mirex derivative was used to establish the structure of a monohydro photoproduct of mirex. (Author abstract reprinted by permission of the American Chemical Society)

74-1818. Rice, C. P.; Sikka, H. C.*; Lynch, R. S. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY 13210). **Persistence of dichlobenil in a farm pond.** *J. Agr. Food Chem. 22(3): 533-534; 1974.* (11 references)

A farm pond in New York State was treated with dichlobenil (2,6-dichlorobenzonitrile) at the rate of 10 lb of active ingredient per surface acre and residues of the herbicide were determined in both the water and hydrosoil. Maximum concentrations of dichlobenil measured in the water and hydrosoil were 1.4 and 8 ppm, respectively. These concentrations were found in samples taken 7 days after treatment. After 7 weeks, 85 and 78% of the maximum detected levels of the herbicide in the water and hydrosoil, respectively, had disappeared. The concentration of dichlobenil had decreased to 0.002 ppm in the water and 0.13 ppm in the hydrosoil, 140 days after treatment. (Author abstract reprinted by permission of the American Chemical Society)

74-1819. Bailey, G. W.; Swank, R. R., Jr.; Nicholson, H. P. (U.S. Environ. Protect. Ag., Southeast Environ. Res. Lab., Athens, GA 30601). **Predicting pesticide runoff from agricultural land: a conceptual model.** *J. Environ. Qual. 3(2): 95-102; 1974.* (47 references)

A mathematical model of the dynamic, single-rainfall-event type is being developed to describe quantitatively pesticide runoff as a function of pesticide and soil properties, agricultural practices, watershed characteristics, and climatic factors. From the model, guidelines governing pesticide use will be derived to prevent or minimize water pollution resulting from runoff from agricultural land. The model described is based on a state-of-the-art approach. Pesticide transport is "piggy-backed" on existing hydrologic and soil-loss models. Both direct mass-balance and areal averaging-statistical simulation approaches are being considered for the basic runoff and sediment transport descriptors. The conceptual structure of the overall model includes source term effects (parameters that determine the initial concentration of pesticide available for runoff), e.g., pesticide formulation, physical-chemical properties, and initial spatial distribution; loss of pesticide from the surface zone between rainfall events by various attenuation processes (volatilization, microbial, chemical, and photochemical degradation, and organism uptake); and loss of pesticide from the soil surface during runoff-producing rainfall events because of mass transfer from soil surface into the moving runoff film and pickup of sediment containing pesticide particulates. The minimum output requirements for the model are the prediction of runoff rate and sediment loading plus the corresponding water and sediment phase pesticide concentrations at a designated boundary (normally a watershed confluence or drainage channel) as a function of time during a runoff event. This output is to be based upon input consisting of the type, formulation, and rate and method of application of the pesticide, and the areal extent, topography, type of soil, cropping characteristic, and rainfall characteristics of the watershed or basin. The model will internally generate and store the appropriate boundary condition changes required to predict sequential rainfall response using between-event meteorological data as input. In addition, the model structure is to be suitable for scaleup for application to areas approaching basin size parametrically, by use of transfer functions, or by use of executive and routing subroutine additions. (Author abstract by permission)

74-1820. Burt, G. W. (Dept. Agron., Univ. Maryland, College Park, MD). **Volatility of atrazine from plant, soil, and glass surfaces.** *J. Environ. Qual. 3(2): 114-117; 1974.* (5 references)

Volatility of atrazine (2-chloro-4-(ethylamino)-6-isopropylamino-*s*-triazine) from glass, plant, and soil surfaces was determined by passing air above the experimental material through florisil columns. Atrazine volatility was determined by counting the ^{14}C-atrazine present in the column eluate and that remaining on the treated surfaces. Volatility from 125-ml glass erlenmeyer flasks was influenced most by the amount of atrazine present. At 40C with an air velocity of 2 liters/min 70% of the applied atrazine was recovered from the florisil columns in 2 days when 1 μg of atrazine was applied, whereas 10% was recovered when 1,000 μg was applied. Temperature, air velocity, and atrazine purity also affected atrazine volatility. Volatility was 25% greater at 40 than at 20C at an air velocity of 2 liters/min. An increase in air velocity increased atrazine volatility more at 20C than at 40C. Approximately 10% more atrazine was lost from a commercially formulated material than from a technically pure material. Dried plant material lost 18-27% of the applied atrazine in 2 days at 40C. Atrazine (37 m*M*) was also applied in 2 μliter droplets to intact *Cirsium arvense* (Canada thistle) leaves. Two days after treatment 50% of the activity was located in the florisil column. Volatility of atrazine from the soil was less than 10% in 2 days at 40 C. It was concluded that atrazine volatility is a major factor for atrazine dissipation when applied to foliage but not when applied to the soil. (Author abstract by permission)

74-1821. Jacobs, L. W.; Keeney, D. R. (Dept. Crop and Soil Sci., Michigan State Univ., East Lansing, MI 48824). **Methylmercury formation in mercury-treated river sedi-**

ments during in situ equilibration. *J. Environ. Qual. 3(2): 121-126; 1974.* (26 references)

An in situ experiment was established at two environmentally different river sites (one each on the Wisconsin and Fox Rivers) to evaluate the extent of methylmercury (MeHg) production in and Hg loss from sediments treated with mercuric chloride ($HgCl_2$) or phenylmercuric acetate (PhHgAc). Bulk sediment was collected from each river site, treated with approximately 1, 10, or 100 ppm Hg (oven-dry basis) as $HgCl_2$ or PhHgAc, and returned to the river site with untreated controls for 2, 4, or 12 weeks of equilibration with the aquatic environment. After each sample retrieval, the sediments were analyzed for total Hg using an aqua regia digest and flameless atomic absorption spectrophotometry and for MeHg by gas chromatography using a modified extraction procedure which is described. Results suggest that Hg losses from stationary sediments are minimal and that sediment transport is probably the major source of Hg movement in a river system. In both sediments, more MeHg was produced from PhHgAc than from a similar concentration of $HgCl_2$, and MeHg concentration increased as the Hg treatment with either compound was increased. The MeHg concentrations found in the Wisconsin River sediments were substantially higher than in the Fox River sediments with a similar Hg treatment. The large differences in MeHg production between these two sediments may be partially attributed to their chemical dissimilarities. The Wisconsin River sediment is acidic and contains more organic materials compared to the Fox River sediment which is more alkaline and contains larger amounts of sulfide sulfur. (Author abstract by permission)

74-1822. Spencer, W. F.; Cliath, M. M.; Farmer, W. J.; Shepherd, R. A. (Univ. of California, Riverside, CA 92507). **Volatility of DDT residues in soil as affected by flooding and organic matter application.** *J. Environ. Qual. 3(2): 126-129; 1974.* (22 references)

In a field experiment, flooding with and without organic matter additions was evaluated as a means of preferentially degrading residual DDT and thereby changing the ratio of the various isomers and metabolites volatilizing from the soil surface. Flooding for a 7-week period, either with or without manure or alfalfa (*Medicago sativa* L.) meal applications, effectively degraded DDT isomers, primarily to the respective DDD (TDE) isomers, but had little effect on DDE isomers. Both flooding and organic matter decreased the volatility even when soil concentrations were not affected, apparently because of increased adsorption of the compounds by added organic matter or by organic matter in the soil altered by flooding. The data indicate that minor changes in vapor concentration ratios were accomplished by flooding and organic matter additions, but regardless of treatment, the major constituent evaporating from the surface was *p,p'*-DDE. To accomplish significant changes in volatilization patterns, it will be necessary to use such management practices before a major part of the DDT has been degraded to DDE. However, flooding and organic matter treatments will ultimately decrease the total quantity of DDE volatilizing from residual DDT in soils over long time periods because of their effectiveness in degrading DDT to DDD instead of DDE. (Author abstract by permission)

74-1823. Reinert, R. E.; Bergman, H. L. (Bur. Sport Fish. and Wildl., Great Lakes Fish. Lab., Ann Arbor, MI 48107). **Residues of DDT in lake trout (*Salvelinus namaycush*) and coho salmon (*Oncorhynchus kisutch*) from the Great Lakes.** *J. Fish. Res. Bd. Can. 31(2): 191-199; 1974.* (20 references)

Concentrations of DDT residues were higher in lake trout (*Salvelinus namaycush*) from southern Lake Michigan in 1966-70 (average 18.1 ppm in fish 558-684 mm long) than in lake trout of the same size-class from Lake Superior in 1968-69 (4.4 ppm), and higher in adult coho salmon (*Oncorhynchus kisutch*) from Lake Michigan in 1968-71 (averages for different year-classes, 9.9-14.0 ppm) than in those from Lake Erie in 1969 (2.2 ppm). Residues were significantly higher in lake trout from southern Lake Michigan than in those from the northern part of the lake. In lakes Michigan and Superior, the levels increased with length of fish and percentage oil. In Lake Michigan coho salmon, the residues remained nearly stable (2-4 ppm) from September of the 1st yr of lake residence through May or early June of the 2nd yr, but increased three to four times in the next 3 mo. Residues in Lake Erie coho salmon did not increase during this period, which preceded the spawning season. Although the concentrations of total residues in whole, maturing Lake Michigan coho salmon remained unchanged from August 1968 until near the end of the spawning season in January 1969, the residues were redistributed in the tissues of the spawning-run fish; concentrations in the loin and brain were markedly higher in January than in August. This relocation of DDT residues accompanied a marked decrease in the percentage of oil in the fish, from 13.2 in August to 2.8 in January. Concentrations of residues were relatively high in eggs of both lake trout (4.6 ppm) and coho salmon (7.4-10.2 ppm) from Lake Michigan. The percentage composition of the residues (*p,p'*-DDE, *o,p'*-DDT, *p,p'*-DDD, and *p,p'*-DDT) did not differ significantly with life stage, size, age, or locality, or date of collection of lake trout or coho salmon. (Author abstract by permission)

74-1824. Eckert, R. E., Jr. (Agr. Res. Serv., U.S. Dept. Agr., Renewable Resource Ctr., Univ. Nevada, Reno, NV). **Atrazine residue and seedling establishment in furrows.** *J. Range Manage. 27(1): 55-56; 1974.* (4 references)

Deep furrows made with shovel openers and simulated disk-type furrows were seeded with intermediate

and crested wheatgrass one year after the application of 1 lb/acre atrazine applied to control cheatgrass and tumble mustard. Atrazine residues in the surface 8 inches of soil at the time of seeding ranged from <0.04 to 0.18 ppm with little residue below 4 inches. However, the residue levels in the surface 2 inches were 0.13 to 0.18 ppm, a value toxic to wheatgrass. All of the furrow treatments reduced the amount of atrazine residue in the seed rows. The shovel furrow treatment was the least effective in reducing the atrazine levels. Atrazine residues in all of the furrow treatments did not exceed 0.05 ppm in the spring of the seedling year. Thus, on the basis of atrazine residue and microclimate characteristics resulting from its use, the deep-furrow rangeland drill is suited for the large-scale application of the atrazine-fallow technique for the establishment of perennial grasses.

74-1825. Minear, R. A.; Benko, J. J.; Lambert, P. T.; Marsh, J. R.; Palesh, C. M.; Powers, F. G.; Rao, P. N.; Scheidelman, R. J. (Dept. Environ. Eng., Illinois Inst. Technol., Chicago, IL). **Organics.** *J. Water Pollut. Contr. Fed. 45(6): 995-1018; 1973.* (155 references)

The impact of organics on water pollution is discussed in terms of oxygen demand, organic carbon, detergents, oil, grease, and pesticides. The recorded levels of organochlorine, organophosphorus, and carbamate pesticides in drinking water, stream water, lake water, coastal water, rain water, bottom sediments, and biological tissues are reviewed, as are methods of determining these levels. A variety of other pesticides, including various herbicides, is also considered; particular emphasis is placed on the organomercury compounds.

74-1826. Geldreich, E. E. (Water Supply Res. Lab., EPA, Cincinnati, OH). **Microbiology of water.** *J. Water Pollut. Contr. Fed. 45(6): 1244-1259; 1973.* (108 references)

The 1972 literature regarding the microbiological aspects of water pollution is reviewed. Specific topics include microbial indicators of pollution; rapid methods for the early detection and quantitation of the general populations of bacteria in water; the microbiology of rivers, lakes, ponds, and reservoirs; the microbiology of potable water; and the microbiology of the estuarine environment and coastal waters. The effects of pollution on the various bacterial populations are discussed. Microbes accumulate and degrade pesticides as well as other organic and inorganic compounds.

74-1827. Kojima, H.; Terakawa, M. (Shiga Prefect. Agr. Exp. Station, Kusatsu, Shiga, Japan). **[A case report of the drift of aerially applied pesticide and its residual amounts in rivers and fields.]** *Kansai Byochugai Kenkukai-ho (Proc. Kansai Plant Protect. Soc.) 16: 121-122; 1974.* (Japanese)

An airplane at a height of 8 m sprayed a mixed microgranular formulation of rabcide (tetrachlorophthalide) and tsumacide (*m*-tolyl *N*-methylcarbamate, MTMC) over 5 ha at a rate of 30 kg/ha on July 26, 1973, under a max. wind speed of 0.03 m/sec to study the drift. The amount of pesticide on target decreased drastically at distances more than 11 m from the flying line. Drift was observed at points 100 m from the flying line. Residues of tetrachlorophthalide were determined in the water, the soil in the treated paddy fields, and the river water which entered into the field. The soil residue decreased from 0.031 ppm to 0.011 ppm during one month; the paddy water residue decreased from 0.053 ppm to 0.007 ppm during 21 days; and the river water residue decreased from 0.012 ppm to 0.006 ppm during 21 days, the limit of detection by GC-ECD being 0.001 ppm.

74-1828. Kutz, F. W.; Johnson, W. G.; Yobs, A. R.; Wiersma, G. B. (Office Pesticides Programs, U.S. EPA, Washington, DC). **The national human monitoring program for pesticides.** *Lab. Invest. 30(3): 380; 1974.*

The Environmental Protection Agency's National Human Monitoring Program was established in 1967 to determine incidences of pesticide residues in the general population on a national scale and to assess changes and trends in these levels. The major ongoing program involves the measurement of organochlorine insecticide residues in samples of human adipose tissue collected at postmortem or during therapeutic surgery. The age, sex, race, clinical pathology diagnosis, and geographic area of residence are determined for each patient sampled. Participating pathologists are selected at random according to a statistical design based on the population census of the country. Program findings through fiscal year 1971 are summarized, with emphasis being placed on the adipose tissue levels of dichlorodiphenyltrichloroethane (DDT) and its metabolites, four isomers of BHC (including lindane), dieldrin, and heptachlor epoxide.

74-1829. Siyali, D. S.; Stricker, P.; Tischler, E. (Pesticide Lab., Div. Analytical Labs., Lidcombe, N.S.W., Australia). **Placental barrier reduces pesticide intake to fetus.** *Med. J. Aust. 1(8): 285; 1974.* (3 references)

Samples of milk, blood, placenta, umbilical cord, and cord blood were obtained from 15 healthy women in Sydney, Australia. Residues of the fungicide HCB were detected in all tissues except the umbilical cord. Residues of DDT were detected in both the cord blood and the mother's blood. However, in all cases, the residue levels in the cord blood were lower than in the mother's blood, HCB being reduced more than DDT. Dieldrin was found in the mother's blood but not in the fetal blood, showing the barrier effect of the placenta. The total organochloride pesticide residue levels corresponded to the relative lipid levels in the tissue. A dynamic equilibrium between different tissues appeared

to exist. Mercury was detected in low levels in the placenta and umbilical cord.

74-1830. Beitz, H.; Weiden-Mueller, S. (Institut fuer Pflanzenschutzforschung Kleinmachnow, Kleinmachnow, DDR). **Zum Rueckstandsverhalten von Chlormequat an Winterweizen. [Residue properties of chlormequat in winter wheat.]** *Nachrichtenbl. Pflanzenschutzdienst DDR 28(1): 17-18; 1974.* (5 references) (German)

The residue dynamics of chlormequat chloride was studied in the straw of winter wheat cv. "Mironovskaya 808" and "Mironovskaya jubilenaya". Chlormequat chloride was applied in doses of 4, 5, and 6 liter/ha. Residue analysis performed 3, 14, and 28 days after application as well as during ripening showed a very rapid decrease of the chlormequat chloride concentration in the plant material, especially during the first two weeks after application and probably due to washout by precipitation rather than to metabolism. Chlormequat chloride once washed out into the soil metabolizes very rapidly. The chlormequat chloride concentration in the straw, as determined during ripening, ranged from 0.1-2.6 ppm, i.e., well below the maximum allowable value of 5 ppm for straw intended for use as fodder for lactating cows.

74-1831. Engst, R.; Knoll, R. (Zentralinstitut fuer Ernaehrung, 1505 Bergholz-Rehbruecke, DDR). **Zur Kontamination von Oberflaechen-, Regen- und Trinkwasser mit chlorierten Kohlenwasserstoffen. [Contamination of surface, rain, and drinking water with chlorinated hydrocarbons.]** *Nahrung 17(8): 837-851; 1973.* (67 references) (German)

Surface, rain, and drinking water samples collected in the Potsdam area were analyzed for residues of organochloride pesticides and their metabolites. Following extraction with *n*-hexane, the samples were analyzed without further cleanup on two gas-chromatographic columns of different polarity with electron-capture detectors. The limit of detection was 0.01 ppb. The residue levels were highest in surface waters: $\leqslant$ 3.2 ppb DDT, $\leqslant$ 0.98 ppb DDE, $\leqslant$ 0.5 ppb DDD (TDE), and 0.01-0.67 ppb lindane. The mean values for 9 samples of rain water were: 0.19 ppb DDT, 0.05 ppb DDE, 0.02 ppb DDD, and 0.08 ppb lindane. The DDT, DDE, DDD, and lindane residue levels in 17 drinking water samples averaged 0.1 ppb, 0.06 ppb, 0.04 ppb, and 0.05 ppb, respectively. Alpha-BHC was detected in two rain water samples. Residues found in drinking water must be considered undesirable even if the daily DDT intake amounts to as low as 0.4 μg.

74-1832. Shimizu, S. (Saga Prefectural Public Health Res. Lab., Saga, Japan). **[Results of pursuing investigation on pesticide residues in Saga Prefecture.]** *Nippon Koshu Eisei Zasshi (Jap. J. Pub. Health) 21(4): 239-245; 1974.* (7 references) (Japanese)

The results of a country-wide investigation of pesticide residues in mother's milk determined that the highest values of total- and beta-BHC (0.39 and 0.38 ppm) were in Saga Prefecture in 1971. Since then efforts have been made to reduce residues in the diet. A more recent investigation of foods, mother's milk, and diets showed considerable reduction of β-BHC contents in the specimens. In foods, the content of β-BHC in meats, fish and shell fish in Ariake Bay, brown rice, and vegetables was respectively 10, 50, 22, and 50% of the former values. β-BHC residues were not found in/on peach, pear, grape, persimmon, and tea leaf. Residual β-BHC in mother's milk averaged 0.19 ppm. There were 11 cases of values higher than 0.34 ppm due to high content of fats in the milk. The food intake of mothers whose milk contained high amounts of β-BHC included a large percentage of food of animal origin (dairy products, eggs, and beef). This rapid decrease of β-BHC residues in foods of plant origin is due to the ban of BHC and washing by rainfalls. A β-BHC content in mother's milk of 0.17 and 0.60 ppm came from mothers who took in calculated daily amounts of β-BHC of 3-4 μg and 67 μg.

74-1833. Nishiyama, K. (School of Public Health, Fac. of Med., Hirosaki Univ., Hirosaki, Aomori, Japan). **[Studies on the prevention of pesticidal hazards: Part 1. On the aerial concentration of pesticides applied in vinyl green house and the acute effects of applied pesticides on living organisms.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 23(1): 1-7; 1974.* (12 references) (Japanese)

Aerial concentrations of zineb applied in vinyl green house were determined in 1971 and 1972 by UV spectrometer at 285 millimicron. The concentration of the active ingredient in the air during application was 0.32 mg/m^3, and decreased to 0.07 mg/m^3 20-30 min. after application in 1971. The value determined in 1972 during application showed a variation from 0.038-0.020 mg/m^3 at some times, and 0.119-0.206 mg/m^3 in the harvest season. The pesticide-application load (RMR by Douglas Bag method) was 1.7 $\pm$ 0.2 for men (applicator) and 0.9 $\pm$ 0.2 for women (assistant). Blood and urine specimens of the applicators were collected before, just after, and one hour after the application. RBC, WBC, Hb, serum protein, ChE, GOT, GPT, TTT, blood urea nitrogen and pH, occult blood, protein, sugar, and urine ketones were determined. No significant changes in these values were attributable to the application although ChE was slightly depressed in men just after application. When the duration of application was 60 min., the inhaled amount of air 15 l/min., and aerial concentration of zineb 0.3 mg/m^3, the inhaled amount of zineb amounted to 0.27 mg/person. From the non-significant changes of chemical and clinical figures of blood and urine, and the small amount of calculated zineb intake from the aerial concentration compared to acute LD50

value (p.o.) of 686.3 mg/kg in mouse, there is no serious health hazard due to application of zineb in vinyl green house except for skin-irritating effects.

74-1834. Nishiyama, K. (School of Public Health, Faculty of Med., Hirosaki Univ., Hirosaki, Aomori, Japan). **[Studies on the prevention of pesticidal hazards: Part 2. On the adhered amount of pesticides to parts of human body during application in vinyl green house.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 23(1): 8-14; 1974.* (11 references) (Japanese)

The amount of adhered zineb (sprayed as a 400-500 fold dilution of 65% WP was determined on the working clothes of a person who engaged in application of zineb in a vinyl green house. Determinations were performed six times during June and July on areas of the cap, chest, back, abdomen, upper- and forearm, hand, thigh, skin and shoe. The obtained values were calculated in $\mu g/10\ cm^2$, and the averaged values were compared. Amounts were largest on shoes (110.3), followed by shin (52.2), then upper arm (25.5), cap (18.6), forearm (17.1), back, thigh, abdomen, hand and chest, suggesting the necessity of care in application and further protection of extremities during application. When the values were observed season-wise (growing and the harvest seasons), pesticide adhesion was greatest on cap and chest. When the values were classified by the kinds of crops (tomato and cucumber), adhesion was larger on thigh, shin, chest, back and upper arms in cucumber culture.

74-1835. Udagawa, T.; Miyata, T.; Saito, T. (Laboratory of Applied Entomol. and Nematol., Faculty of Agr., Nagoya Univ., Nagoya, Aichi, Japan). **[Fate of ^{32}P-pyridafenthion, *O,O*-diethyl-*O*-(3-oxo-2-phenyl-2H-pyridazine-6-yl) phosphorothioate in soils.]** *Noyaku Kagaku (J. Pestic. Sci.) 1(4): 159-162; 1974.* (13 references) (Japanese)

The fate of ^{32}P-pyridafenthion was studied in three kinds of soil (those in Utsunomiya, Anjo, and Chigasaki) and compared with those of ^{32}P-dimethoate and ^{32}P-disulfoton; specific radioactivity was 0.18, 0.58, and 0.90 mCi/g. An amount corresponding to 50 g of dry soil was surface-treated with the emulsion of the pesticide at a concentration of 20 ppm with water, increasing the soil moisture to 60 % of maximum soil moisture capacity. The whole system was closed and left at 24-26 C in the dark. The soil samples were extracted with acetone after designated time periods, and after distribution with chloroform each component (soil, chloroform, and water) was analyzed radiologically. The three pesticides were rapidly decomposed, the percentage of ^{32}P to added ^{32}P in chloroform layer was 19-27 of pyridafenthion, 3-9 of dimethoate, and 28-44 of disulfoton. The larger part of added radioactivity was coupled with soil after 50 days. Compounds in the chloroform layer were almost always the parent compound in the case of pyridafenthion and dimethoate. In the case of disulfoton, two other spots corresponding to the sulfoxide and sulfone of disulfoton were found additionally. The half lives of three compounds in this experiment were 3.3-6 days disulfoton, 7.5-15 days dimethoate, and 11-24 days pyridafenthion. Because of the insecticidal activity of the sulfoxide and sulfone of disulfoton, the half-life was 18-28 days. Of the three soils, the three compounds decomposed most swiftly in soil of Utsunomiya which contained the highest amount of organic matter.

74-1836. Borg, K. (Nat. Vet. Inst., Stockholm, Sweden). **Wildlife as an indicator of environmental pollution.** *OECD Agr. Rev. 20(4): 120-122; 1973.*

During routine investigations of causes of death of wildlife in Sweden in the 1950's, an increase in the frequency of malnutrition was observed among wild birds. This malnutrition was soon correlated with the consumption of dressed seed, and analyses of kidneys and livers revealed mercury residues ranging from 3 to 100 mg/kg. High levels were found in predatory birds as well as seed-eating birds and in their eggs. Populations of many bird species were badly affected until the use of methyl mercury seed dressings was banned in 1966.

74-1837. Burns, J. E. (U.S. Pub. Health Serv., Tech. Serv. Div., Off. Pestic. Programs, U.S. Environ. Protect. Agency, San Benito, TX 78586). **Organochlorine pesticide and polychlorinated biphenyl residues in biopsied human adipose tissue—Texas 1969-72.** *Pestic. Monit. J. 7(3/4): 122-126; 1974.* (23 references)

Organochlorine pesticide residue levels were determined in 221 samples of human adipose tissue from elective surgery in 1969-72 in the lower Rio Grande Valley of Texas. Standard electron capture–gas liquid chromatographic methods were used. The total DDT level was 23.18 ppm; the DDE level was 17.37, the highest yet reported for a general population. Dieldrin and β-BHC levels were also high: 0.35 and 1.29 ppm, respectively. No decrease in storage levels during the study period was detected. There was no difference due to sex, but Mexican-Americans had significantly higher residues of DDE, *p,p'*-DDT, and dieldrin than did Anglo-Americans. Polychlorinated biphenyls were detected in 15 samples in 1971 but none were detected in the other 3 years. (Author abstract by permission)

74-1838. Simpson, R. E.; Horwitz, W.; Roy, C. A. (Off. Sci., U.S. Dept. Health, Educ., Welfare, Food Drug Admin., Washington, DC 20204). **Surveys of mercury levels in fish and other foods.** *Pestic. Monit. J. 7(3/4): 127-138; 1974.* (13 references)

The Food and Drug Administration (FDA) conducted a series of surveys of the mercury content of food in 1970, 1971, and 1972. The surveys included a

wide variety of fish samples from selected freshwater regions, commercial fish from wholesale distributors, and swordfish and canned tuna fish; 10 commodities representing a high proportion of total food consumption; and 12 total diet fractions collected in the FDA continuing market basket study to determine pesticide residues in the basic 2-week diet of a 19-year-old male. For most samples analyzed, atomic absorption was used as the determinative step; the more sensitive neutron activation technique was used to confirm low levels of mercury found by the atomic absorption method. Swordfish samples showed the highest incidence of mercury and the average mercury content, with levels in excess of 1 ppm in more than 50% of the samples examined. Approximately 4% of the canned tuna fish contained mercury in excess of the FDA guideline of 0.5 ppm for mercury in fish. Some freshwater species contained elevated levels of mercury traceable to known sources of mercury pollution. Of other commercial fish sampled, halibut, bonita, mackerel, cod, and snapper contained some elevated mercury levels, but averaged below the 0.5 ppm guideline. In the survey of mercury in foods in which 10 food commodities were analyzed, mercury was detected only in shrimp at levels approximating 0.05 ppm. In the total diet fractions only meat, fish, and poultry contained mercury as high as 0.04 ppm. All other fractions contained mercury levels lower than the sensitivity of the method, i.e., 0.002 ppm on a dry-weight basis. (Author abstract by permission)

74-1839. Markin, G. P.; Hawthorne, J. C.; Collins, H. L.; Ford, J. H. (Forestry Sci. Lab., Corvallis, OR 97331). **Levels of mirex and some other organochlorine residues in seafood from Atlantic and Gulf Coastal states.** *Pestic. Monit. J. 7(3/4): 139-143; 1974.* (9 references)

A seafood monitoring program for the insecticide mirex was set up in 1971. Seventy-seven composite samples of oysters, crabs, shrimp, fish, and fish products were collected from seven locations within the area where mirex is used and from two check locations outside the treatment areas. The study showed that mirex occurred in only nine of the 77 samples (0.005-0.024 ppm range), all from near Savannah, Georgia. DDT or its metabolites occurred in 74 samples (0.002-2.475 ppm range). The polychlorinated biphenyl (PCB) Aroclor 1260 occurred in 46 samples; if extensive new methods of cleanup had not been used, these PCB residues probably would have been interpreted as mirex. Several early studies reporting extensive residues of mirex in marine life were made before the possibility of confusing Aroclor 1260 with mirex had been realized; hence these earlier studies may be in error. (Author abstract by permission)

74-1840. Borthwick, P. W.; Cook, G. H.; Patrick, J. M., Jr. (Gulf Breeze Environ. Res. Lab., Gulf Breeze, FL 32561). **Mirex residues in selected estuaries of South Carolina–June 1972.** *Pestic. Monit. J. 7(3/4): 144-145; 1974.* (3 references)

Estuarine sediments, crabs, shrimps, and fishes were collected in June 1972 at seven stations two years after aerial applications of mirex bait for control of fire ants in coastal areas near Charleston, S.C. These stations had previously been monitored (October 1969 to June 1971) when levels of mirex in animal samples were: crabs, 0-0.60 ppm; shrimps, 0-1.3 ppm; and fishes, 0-0.82 ppm. The recent study showed that mirex was present in three species of fishes (white catfish, 0.021 ppm; bluegill, 0.047 ppm; carp, 0.12 ppm) and blue crabs (0.026 ppm) at two freshwater stations. However, mirex was not detected in 36 animal samples, most of which were taken from nine saline stations in the estuaries after a period of restricted use of the pesticide. Analysis of bottom sediment samples at all stations detected no mirex. The lower limit of detection for mirex was 0.01 ppm. (Author abstract by permission)

74-1841. Schultz, D. P.; Whitney, E. W. (Southeastern Fish Contr. Lab., Fish and Wildl. Serv., Bur. Sport Fish. and Wildl., U.S. Dept. Inter., Warm Springs, GA 31830). **Monitoring 2,4-D residues at Loxahatchee National Wildlife Refuge.** *Pestic. Monit. J. 7(3/4): 146-152; 1974.* (11 references)

Over 7,000 acres along the Hillsboro perimeter canal in Loxahatchee National Wildlife Refuge (NWR), Florida, were sprayed in 1971 with the dodecyltetradecyl amine salts of 2,4-D (DTA-2,4-D) at a rate of 4.48 kg acid equivalent (a.e.) per hectare to control waterhyacinth (*Eichornia crassipes*). Three stations were established along the canal to collect samples of fish, water, and mud for residue analysis and to monitor water quality. The initial application of 2,4-D, followed by spot treatments of DTA-2,4-D and/or the dimethylamine salt of 2,4-D (DMA-2,4-D) over a 4-month period, achieved excellent control of waterhyacinth. The highest 2,4-D residue level measured in water (0.037 mg/l) was found on the day following the initial treatment. The highest levels in hydrosol (0.005 mg/kg) occurred 3 to 15 days after treatment. Among 60 samples of fish, 3 had herbicide residue levels greater than 0.010 mg/kg, 16 had less than 0.010 mg/kg, and the remainder had no detectable residue levels. Breast muscle and liver of common Florida gallinules (*Gallinula chloropus*) had residue levels of 0.30 mg/kg and 0.675 mg/kg, respectively, 1 day after spraying, and no detectable residues 4 days after spraying. The herbicide apparently caused no ill effects on hatching of boat-tailed grackle (*Cassidix mexicanus*) eggs or development of fledglings. (Author abstract by permission)

74-1842. Heath, R. G.; Hill, S. A. (Bur. Sport Fish. and Wildl., Patuxent Wildl. Res. Cent., Laurel, MD 20810). **Nationwide organochlorine and mercury residues in wings of adult mallards and black ducks during the**

1969-70 hunting season. *Pestic. Monit. J. 7(3/4): 153-164; 1974.* (14 references)

Nationwide monitoring of organochlorine and mercury residues in wings of approximately 5,200 adult mallards and black ducks bagged during the 1969-70 hunting season showed DDE, as in 1965 and 1966, to be the predominant residue. PCB's were next in overall prevalence, followed by mercury, DDT, dieldrin, DDD (TDE), and heptachlor epoxide. There was no indication of a decrease in levels from 1966. Residues were generally highest in the Atlantic and Pacific Flyways and lowest in the Central Flyway; PCB's, however, were highest in the Atlantic Flyway and diminished westward across the Nation. Mercury residues were highest in Atlantic Flyway black ducks. Monitoring results were consistent: States with high residues in 1965 and 1966 were again high in 1969. Analyses of individual wings of mallards from California and black ducks from New Jersey and New York revealed DDE residues as high as 41 ppm and certain regional and seasonal differences in levels within States. They also revealed an apparent tendency for DDE residues to be more variable and to attain higher levels in male than in female wings. (Author abstract by permission)

74-1843. Frank, R.; Armstrong, A. E.; Boelens, R. G.; Braun, H. E.; Douglas, C. W. (Ontario Pestic. Residue Testing Lab., Ontario Ministry of Agr. and Food, Guelph, Ontario, Canada). **Organochlorine insecticide residues in sediment and fish tissues, Ontario, Canada.** *Pestic. Monit. J. 7(3/4): 165-180; 1974.* (17 references)

River and lake sediments and several species of fish were collected from four study areas in the Province of Ontario. These consisted of one agricultural, two mixed agricultural–recreational, and one recreational study area. Large volumes of DDT and dieldrin were used in the first area, small quantities were used in the mixed areas, and insignificant quantities were used in the recreational area. The agricultural and mixed areas were located on deep alluvial soils; the recreational area was located on bare-to-thinly-covered Precambrian rock. Residue levels in sediments were similar in all four areas, but slightly higher in the recreational area. The ratios of DDT to its metabolites, DDE and TDE, were similar in all areas in that the metabolites predominated over the parent DDT. Residues of DDT and dieldrin in fish tissues tended to depend on feeding habits, fat content, and age of the fish. Residues in the sediment (dry weight) were almost the same as residues found in the low-fat benthic invertebrate and plankton feeders. Residues increased in the low-fat piscivores, were slightly higher in the high-fat feeders, and were highest in the high-fat piscivores. The concentration of DDT and dieldrin in the tissues and extractable fat and the actual quantity accumulated per fish increased as size and weight of any one species increased. The increase in total DDT or dieldrin concentration from lowest to highest tissue residues of all fish species was of the order of 100 to 500 times; the increase in body load was of the order of 10^3 to 10^4. Higher concentrations in fish tissue were correlated with the higher sediment levels of the Precambrian recreational area. Data demonstrate that the use of even minute quantities of persistent chlorinated hydrocarbons in rocky Precambrian watersheds has a profound effect on sediment and biota contaminants. Use on deep rich soils has a similar effect, but not in the same proportion to the quantity used. (Author abstract by permission)

74-1844. Kreitzer, J. F. (Patuxent Wildl. Res. Cent., Div. Wildl. Res., Bur. Sport Fish. and Wildl., U.S. Dept. Inter., Washington, DC 20240). **Residues of organochlorine pesticides, mercury, and PCB's in mourning doves from eastern United States–1970-71.** *Pestic. Monit. J. 7(3/4): 195-199; 1974.* (2 references)

Mourning dove (*Zenaidura macroura*) breast muscle samples from birds collected in 1970-71 from Rhode Island, Pennsylvania, Maryland, Missouri, Kentucky, Virginia, Arkansas, Tennessee, North Carolina, South Carolina, Mississippi, Alabama, Georgia, Louisiana, and Florida were found to contain residues of DDT, DDE, DDD (TDE), polychlorinated biphenyls, dieldrin, mirex, mercury, and heptachlor epoxide in amounts not considered hazardous to consumers, human or nonhuman. There were 145 birds involved, 7 to 10 from each State. Residues of DDT plus DDE plus DDD averaged 5.83 ppm lipid weight (0.068 ppm wet weight); those of PCB's, 9.75 ppm lipid weight (0.121 ppm wet weight); compounds were found in all birds. Heptachlor epoxide and dieldrin were found in little more than trace amounts: heptachlor in all birds, dieldrin in 73. Mirex was found only in birds from South Carolina, Georgia, and Florida, averaging 4.32 ppm lipid weight (0.046 ppm wet weight) in eight birds. Less than 0.05 ppm (wet weight) mercury was found in all birds except 10, in which it ranged from 0.07 to 0.67 ppm. The 10 were from Rhode Island, Pennsylvania, Maryland, Virginia, Tennessee, and Alabama. (Author abstract by permission)

74-1845. Kuhr, R. J.; Davis, A. C.; Bourke, J. B. (Dept. Entomol., New York State Agr. Exp. Sta., Geneva, NY 14456). **DDT residues in soil, water, and fauna from New York apple orchards.** *Pestic. Monit. J. 7(3/4): 200-204; 1974.* (15 references)

Five commercial apple orchards which had not been sprayed extensively with DDT since approximately 1960 were surveyed in 1972 for residues of DDT and its metabolites. In addition to the parent compound, DDE and DDD (TDE) were almost always recovered, but no dicofol was detected in any soil sample. Total residues in the top 6-in. soil layer underneath the trees ranged from 21.8 to 259 lb/acre. Between the rows of trees the levels were considerably lower; they ranged from 7.3 to 78.5 lb/6-in. acre. In one heavily contaminated orchard, researchers also analyzed stream water, stream-bottom

mud, and animals. Very low amounts of DDT (0.32 ppb) and DDD (0.042 ppb) were found in the water, and residues in stream-bottom mud totaled less than 1 ppm. Worms, slugs, snails, tadpoles, fingerling fish, and frogs all contained DDT, DDE, and DDD. (Author abstract by permission)

74-1846. Gibson, J. R.; Jones, G. A.; Dorough, H. W.; Lusk, C. I.; Thurston, R. (Dept. Entomol., Univ. Kentucky, Lexington, KY 40506). **Chlorinated insecticide residues in Kentucky burley tobacco: crop years 1963-72.** *Pestic. Monit. J. 7(3/4): 205-213; 1974.* (7 references)

Kentucky Burley tobacco representing crop years 1963-70 was sampled from the storage facilities of Burley Tobacco Growers Cooperative Association and from auction warehouses in Kentucky in 1968-72. Analyses of these samples in 1972 showed 100% contained DDT-TDE; 96%, dieldrin; 31%, endrin; and 4%, toxaphene. Endosulfan residues were first detected in a few samples of the 1968 tobacco but were present in 100% of the 1970 and 1972 tobacco, and in 83% of the 1971 crop. Average total chlorinated insecticide residues in tobacco produced during 1963-65 were approximately 20 ppm, and for that produced during 1966-69, levels were about 50 ppm. Levels dropped markedly in 1970 to 12 ppm, declined to 9 ppm in 1971, and then to 4 ppm in 1972. During the years when residues were highest, DDT-TDE constituted over 90% of the total, but declined so rapidly after 1968 that they accounted for only 8% of the total chlorinated insecticide residues in the 1972 tobacco; 90% of the residues on the 1972 tobacco was endosulfan. The relationships of area and year of production to the levels of chlorinated insecticide residues on Burley tobacco are discussed. (Author abstract by permission)

74-1847. Wiersma, G. B.; Tai, H. (Ecol. Monit. Branch, Tech. Serv. Div., Off. Pestic. Programs, U.S. Environ. Protect. Agency, Washington, DC). **Mercury levels in soils of the eastern United States.** *Pestic. Monit. J. 7(3/4): 214-216; 1974.* (6 references)

Cropland and noncropland soils were sampled to determine levels of elemental mercury present in the upper three inches of soil. Results showed no differences in mercury levels between cropland and noncropland soils. Levels detected compared closely to levels found in similar studies. Actual mean levels of mercury residues in soils of the eastern United States ranged from 0.05 to 0.10 ppm. (Author abstract by permission)

74-1848. White, J. L.; Cruz, M. (Purdue Univ., Lafayette, IN 47907). **Soil colloids and behavior of pesticides in soils.** *Proc. Indiana Acad. Sci. 81: 305; 1972.*

The nature and properties of the surfaces of the colloidal components of soil greatly influence the interaction of pesticides with the soil. Infrared and other spectroscopic studies of interactions of organic molecules with surfaces of aluminosilicate minerals have elucidated the mechanisms of adsorption, bonding, and degradation of several groups of pesticides. The role of the higher degree of dissociation of water molecules on clay surfaces in the protonation and hydrolysis of chlorotriazines has been demonstrated. Desorption and volatilization losses may be explained by the competition between pesticide molecules and water molecules for adsorption sites and changes in the environment of the pesticide molecules associated with physical adsorption processes.

74-1849. Zweig, G. (Syracuse Univ. Res. Corp., Syracuse, NY 13210). **Review: pesticide residues in food.** *Qual. Plant. Pl. Foods Hum. Nutr. 23(1/3): 77-112; 1973.* (64 references)

The evidence which links the presence of trace amounts of pesticides in man to disease or debility has been investigated. DDT has been banned in the U.S., and other organochlorines have been restricted in East European countries, suggesting concern over the accumulation of these chemicals and possible long-term effects. The most probable route of entry in man is via his food. Residues of organophosphates and most herbicides in food do not seem to pose the same problem of biomagnification, but amitrole, mercurials, and 2,4,5-T containing dioxin are exceptions. Tolerances should be based on the end use of raw agricultural commodities since processing in many cases reduces pesticide residues. Thorough testing of new chemicals must be undertaken and the cost shared by the world community which benefits from the use of pesticides.

74-1850. Lyubenov, Ya. (IZR, Sifiysko, Bulgaria). **Vuzmozhnosti za zamursyavane na vodite i na vodnite baseyni ot nyakoi izpolzvani u nas kherbitsidi. [Pollution of waters and water basins by herbicides used in Bulgaria.]** *Rastit. Zasht. 21(2): 33-36; 1973.* (Bulgarian)

The hazards of surface water and groundwater contamination by herbicides used in Bulgaria and ichthyological aspects are surveyed. Derivatives of 2,4-D and DNOC have low toxicity in fish. Residues were not detected in fish exposed to 5 ppm concentration of 2,4-D. Triazine derivatives such as simazine, atrazine, prometryne, and ametryne do not present surface water and groundwater contamination hazards because of their rapid adsorption by humus and clay particles. When applied as prescribed, triazines are harmless for warm-blooded animals and fish. Dalapon, though soluble in water, is not toxic for fish in concentrations below 300 ppm. The leachout of afalon (linuron), patoran (metobromuron), and cotoran (fluometuron) from soil into surface water and groundwater is negligible due to intense adsorption by soil particles. Paraquat and diquat are harmless for fish provided they are applied as pre-

scribed. However, water treated with these herbicides should not be used as drinking water for 7 to 10 days. Diquat concentration decreased from 2.5 mg/liter to 0.01 mg/liter in 9 days. When not directly applied in water, trifluralin is harmless for fish due to its very low solubility and rapid adsorption by organic matter and clay particles. DNOC- and DNBP-based herbicides are toxic for fish in concentrations as low as 0.4 ppm.

74-1851. Viel, G. (Laboratoire de Phytopharmacie, Inst. National de Recherches Agronomiques, Versailles, France). **Toxicite des residus de pesticides dans les corps gras. [Toxicity of pesticides in fats.]** *Rev. Fr. Corps Gras 21(3): 155-160; 1974.* (7 references) (French)

General problems of the toxicity and the mechanisms of action of pesticides and the toxicity and dynamics of pesticide residues in fats are surveyed. Many pesticides interfere with certain enzyme systems in animals; enzymatic changes, such as inhibition of the cholinesterase activity by organophosphorus pesticides, may be indicative of the toxic effect. The contamination of milk and milk products and animal fat by organochlorine pesticides may be due to the treatment of the animals or of the facilities or to the ingestion of contaminated fodder. Cows fed very small doses of organochlorine pesticides had steadily increasing pesticide residue levels in the milk during the first 40 days, a stabilization of the residue level, and a reduction upon termination of the pesticide administration. Organochlorine pesticides including BHC, α-BHC, lindane, β-BHC, heptachlor epoxide, dieldrin, DDE, TDE, and *p,p'*-DDT are also found in human fat and milk.

74-1852. Wolff, J. P. (Laboratoires Wolff, Paris, France). **Evolution des pesticides au cours des operations industrielles d'obtention et de raffinage des corps gras. [Release of pesticides during industrial processes for production and refining of fats.]** *Rev. Fr. Corps Gras 21(3): 161-164; 1974.* (8 references) (French)

The effects of extraction, neutralization, decolorization, and deodorization processes on organochlorine pesticide levels in oils obtained from such oil-seeds as colza, sunflower, soybean, and peanut were studied. Colza, sunflower, and peanut oil samples were artificially contaminated with BHC, heptachlor, aldrin, DDT, DDE, and DDD (TDE) to obtain an overall organochlorine pesticide level in excess of 60 ppm. Deodorization was chiefly responsible for the elimination of the pesticide residues from the oils investigated. The efficiency of deodorization at high temperature for the removal of the organochlorine pesticides exceeded 99.9%, so that no more residues were detected in commercial grade oil. No organochlorine pesticide residues were determined in oil cake.

74-1853. Panchenko, S. Ye. (Azov Sci. Res. Inst. Fishing and Fish Resources, USSR). **O nakoplenii pestitsidov v rybe. [On the accumulation of pesticides in fish.]** *Ryb. Khoz. 12: 31-32; 1972.* (Russian)

The accumulation of organochlorine and organophosphorus pesticides was studied in the liver, muscles, and branchiae of wild carp, northern pike, rudd, European pikeperch, roach, bream, and tench living in Karpiyevskiy Firth. The order of intensity of accumulation was as follows: northern pike, wild carp, rudd, European pikeperch, roach, tench, and bream. The organochlorine pesticide residue levels were highest in the liver with cumulation factors of up to 5,200, lower in muscles, and least in the branchiae. The organochlorine pesticide accumulation and consequently the residue levels were highest during July and August; the accumulation of organophosphorus pesticides was most intense during July and August in the branchiae, during August and September in the muscles, and during July to early August in the liver. Even very low pesticide concentrations, not exceeding 0.05 mg/liter, may result in accumulation of organochlorine and organophosphorus pesticides in different organs of the fish, and cause reduced reproductive capacity and death.

74-1854. Shiota, K.; Tanimura, T.; Nishimura, H.; Mizutani, T.; Matsumoto, M. (School of Anatomy, Fac. of Med., Kyoto Univ., Kyoto, Japan). **[Polychlorinated biphenyls, BHC, and DDE in human fetal tissues.]** *Senten Ijo (Congenital Anomalies) 13(3): 179; 1974.* (Japanese)

Nineteen human embryos between 5 and 8 weeks and 14 human fetuses were analyzed for PCB, β-BHC, and *p,p'*-DDE residues. Whole embryos contained no PCB, 0.016 ppm of β-BHC, and 0.004 ppm of *p,p'*-DDE. Contents of these three compounds in tissues of 10 fetuses between four and seven months ranged from 0.002-0.023, 0.009-0.041, 0.002-0.008 ppm in cerebrum; 0.007-0.12, 0.019-0.057, 0.004-0.028 ppm in myocardium; 0.003-0.033, 0.009-0.106, 0.009-0.042 ppm in liver; 0.006-0.020, 0.009-0.013, 0.006-0.025 ppm in kidney; and 0.017-0.12, 0.037-1.44, 0.007-0.366 ppm in skin. Residues in four fetuses (10 month) were 0.002-0.008, 0.002-0.028, 0.002-0.011; 0.004-0.011, 0.027-0.043, 0.005-0.036; 0.010-0.090, 0.039-0.067, 0.017-0.094; 0.006-0.010, 0.025-0.041, 0.007-0.015; and 0.48-0.76, 0.791-1.34, 0.767-1.44. These values obtained by gas chromatography with ECD were lower than those in children and adults, suggesting that there is little danger of concentration of these compounds in the fetus.

74-1855. Hance, R. J. (Agr. Res. Council, Weed Res. Org., Begbroke Hill, Yarnton, Oxford OX5 1PF, England). **Soil organic matter and the adsorption and decomposition of the herbicides atrazine and linuron.** *Soil Biol. Biochem. 6(1): 39-42; 1974.* (10 references)

Sandy loam soil was subjected to a variety of extractive treatments to provide a series of materials

with different organic residues. These preparations were inoculated with an aqueous extract of untreated soil and incubated at 20°C with solutions containing 1-10 μg/ml atrazine or linuron. The degradation rates of these herbicides in the various soils were unrelated to the adsorptive properties of the soils. The rates were lowest when virtually all of the organic matter had been removed by peroxidation. The most rapid breakdown occurred in samples which had been successively extracted with ethanol + toluene, hot water, dilute acid, and dilute alkali. The organic residue left after this sequence probably contained hydrolyzed materials which were easily metabolized and which could support the most active microbial population. Since very slow breakdown occurred in the peroxidized soil, it is likely that herbicide degradation occurred incidentally to the general metabolism of organic material in the soil and that the compounds were not used as primary carbon or nitrogen sources.

74-1856. Moergeli, B. (Division Pompes, Installation de Traitement d'Eau, Switzerland). **Elimination des pesticides de l'eau potable. [Elimination of pesticides from drinking water.]** *Sulzer Tech. Rev. 54(2): 91-96; 1972.* (13 references) (French)

The efficiency of different stages of drinking water preparation (rapid sand filtration, ozonization, and adsorption on activated carbon) in the removal of residual quantities of lindane from drinking water was studied in a pilot test. Neither rapid sand filtration nor ozonization at different ozone expenditures were sufficient for the removal of lindane. Adsorption on activated carbon in a minimal layer thickness of 70 cm and at a flow rate of 7.5 to 15 m/hr proved excellent for the removal of lindane from drinking water.

74-1857. Kanamaru, N.; Ogawa, T. (Lab. of Soil and Fertilizers, Div. of Agr. Chemistry, Tokyo Metropolitan Agr. Exp. Sta., Tachikawa City, Tokyo, Japan). **[On the persistency of a few agricultural chemicals in crops.]** *Tokyo-To Nogyo Shikenjo Kenkyu Sokuho (Prompt Reports of Studies 1973, Tokyo Metrop. Agr. Exp. Sta.): 37-38; 1974.* (Japanese)

Persistence of agricultural chemicals on crops was studied to obtain data for establishing the standards of safe use; 4 kinds and 6 formulations of agricultural chemicals were used and the residues determined. Nitrofen applied to carrots just after sowing remained in carrot root at a concentration of 0.01 ppm after 14 days (over all application). When applied twice at harvest season, it remained in the root at 0.02 ppm after 7 days (interstand application). Simazine granules, applied once just after sowing and twice at harvest time, were not detected in carrot root (limit of detection 0.006 ppm). Diazinon EC applied on garland chrysanthemum remained in the leaves at 2.0 ppm after 14 days. Diazinon granules applied to carrot crops at the sowing time remained in carrot root at 0.03 ppm after 125 days (applied 3 kg/10 are) and 0.03 ppm after 192 days (applied 5 kg/10 are). Diazinon WP applied on turnip remained in the leaves at 3-4 ppm and in the root at 0.5 ppm, regardless of number (1-5) of applications. When dimethoate granules were applied on turnip fields, no residues were detected in any part of turnip (applied 3 and 6 kg/10 are). Herbicides such as nitrofen and simazine can be safely applied on root crops and solid-headed vegetables; application of formulations of diazinon to edible herbs should be done carefully.

74-1858. Kanamaru, N.; Ogawa, T. (Tokyo Metropolitan Agr. Exp. Station Tachikawa, Tokyo, Japan). **[Results of pesticide residue investigation on agricultural products in Tokyo metropolis (Part 1 of Pesticide Safety Measures).]** *Tokyo-To Nogyo Shikenjo Nenpo (Annu. Rep. Tokyo Metropol. Agr. Exp. Sta. 1972) :49-50; 1973.* (Japanese)

Pesticide residues were determined in agricultural products, 80 samples of 15 species. BHC was detected in almost all the samples; however, the concentration was either a little more or less than one hundredth of the standard. Aldrin, dieldrin, endrin, and heptachlor were detected in 12 species. Residues of dieldrin and endrin in cucumber were more than the standard value. A small amount of organophosphorus pesticides such as dichlorvos and fenitrothion was detected in Japanese radish, pear, and cabbage.

74-1859. Kanamaru, N.; Ogawa, T. (Tokyo Metropolitan Agr. Exp. Station Tachikawa, Tokyo, Japan). **[Studies on the fate of applied pesticide onto agricultural crops (Part 2 of Pesticide Safety Measures).]** *Tokyo-To Nogyo Shikenjo Nenpo (Annu. Rep. Tokyo Metropol. Agr. Exp. Sta. 1972): 50; 1973.* (Japanese)

Diazinon granular formulation, diazinon WP, and dimethoate granular formation were respectively applied to carrot and turnip crops. Residues were determined as to the times of application, rate of application, and the days after the date of the last application. The results showed that the residues of diazinon applied as granules were 0.022-0.058 ppm on carrot, far lower than the standard of diazinon residue on other crops. The residue of diazinon applied as a dispersion (diluted WP) was 2.7-14.8 ppm in the top and 0.24-2.0 ppm in the root of turnip, suggesting the necessity of establishing a rigorous use standard; residues were not detected in the top nor in the root of turnip onto which dimethoate had been applied as granules.

74-1860. Kanamaru, N.; Ogawa, T. (Tokyo Metropolitan Agricultural Experiment Station Tachikawa, Tokyo, Japan). **[Results of experiments on removing pesticide residues by washing with a neutral detergent solution (Part 3 of Pesticide Safety Measures).]**

Tokyo-To Nogyo Shikenjo Nenpo (Annu. Rep. Tokyo Metropol. Agr. Exp. Sta. 1972) 50-51; 1973. (Japanese)

Commercial strawberries and tomatoes were soaked in a dispersion of malathion for three-four days, then washed with aqueous solution of Raipon F at 0.04%. Determinations of malathion were performed on the washed fruits and in the washings. The percentage of removal increased with increased washing time. In strawberries there was no difference between washing with water and detergent when washing time was one minute. However, detergent was more effective then water when the washing time was longer than three minutes. In soaked tomatoes, the removal percentage increased with length of washing also, and no difference was noticed between water-washing and detergent-washing.

74-1861. Kanamaru, N.; Ogawa, T.; Akima, S. (Tokyo Metropol. Agr. Exp. Station Tachikawa, Tokyo, Japan). **[Investigation of water pollution by dichlorvos (Part 4 of Pesticide Safety Measures).]** *Tokyo-To Nogyo Shikenjo Nenpo (Annu. Rep. Tokyo Metropol. Agr. Exp. Sta. 1972): 51; 1973.* (Japanese)

The pollution of river water from a field of growing Wasabi (Japanese horse radish cultivated in flooded field with flowing water) where dichlorvos was applied for protection against aquatic pest insects was studied. The usual amounts of dichlorvos were applied in a Wasabi field and the concentration of dichlorvos was determined 500 m downstream of the field every 20 minutes by collecting the water and extracting with benzene, then using GC with FPD. Ten minutes after application began dichlorvos arrived at the monitoring point; the concentration peaked at 0.47 ppm after 30 minutes, then decreased slowly to 0.001 ppm after 3 hr. However, even after 5 hr 0.2 ppb of dichlorvos was detected. Although dichlorvos showed a remarkable effect in killing aquatic pest insects such as Perla spp., no fish could be seen, suggesting the necessity of considering the effect of dichlorvos on the ecosystem.

74-1862. Deelstra, H. (Universitaire Instelling Antwerpen, Antwerp, Belgium). **Etude d'orientation des effets secondaires de l'utilisation des pesticides autour du lac Tanganyika. [Preliminary study on secondary effects of pesticide use around Lake Tanganyika.]** *Trib. CEBEDEAU (Cent. Belge Etude Doc. Eaux) 27(363): 93-96; 1974.* (22 references) (French)

The organochlorine and organophosphorus pesticide residue contents in three typical fish species of Lake Tanganyika: *Stolothrissa tanganicae, Limnothrissa miodon,* and *Luciolates*, were studied to determine the secondary effects of pesticide use on cotton, sugar cane, and coffee plantations around Lake Tanganyika. Following extraction of the residues from sun-dried specimens, determination was done by gas chromatography with electron capture detector for organochlorines, and flame-ionization detector for organophosphates. Specimens of *Stolothrissa* contained 0.09 ppm *p,p'*-DDE, traces of *p,p'*-DDD (TDE), and 0.12 ppm *p,p'*-DDT in November; 0.12 ppm *p,p'*-DDE and 0.24 ppm *p,p'*-DDT in March; and 0.19 ppm *p,p'*-DDE, 0.13 ppm *p,p'*-DDD, 0.31 ppm *p,p'*-DDT, and 0.80 ppm lindane in May. *Limnothrissa* specimens investigated in May contained 0.55 ppm *p,p'*-DDE, 0.23 ppm *p,p'*-DDD, 1.06 ppm *p,p'*-DDT, and 1.4 ppm lindane; specimens of *Luciolates* investigated at the same time contained 0.08 ppm *p,p'*-DDE, traces of *p,p'*-DDD, 0.13 ppm *p,p'*-DDT, and 0.22 ppm lindane. Organophosphorus pesticide residues were not detected, probably due to rapid degradation. Small-size fish seem to absorb pesticides directly from the water rather than via the trophic chain.

74-1863. Usoroh, N. J.; Hance, R. J. (Fed. Dept. Agr. Res., P.M.B. 5042, Moor Plantation, Ibadan, Nigeria). **The effect of temperature and water content on the rate of decomposition of herbicide linuron in soil.** *Weed Res. 14(1): 19-21; 1974.* (12 references)

Rates of linuron breakdown were measured in soil held at the water-holding capacity (WHC), ½ WHC and ¼ WHC, and at two temperatures, 4°C or 22°C. Breakdown rates were greater at the higher temperature and increased with water content. The energy of activation for the degradation was calculated. Comparison with published figures leads to the speculation that the initial step in degradation by microorganisms is different from that in chemical processes. (Author abstract by permission)

74-1864. Nowak, A.; Swarcewicz, M.; Wybieralski, J. (Instytut Gleboznawstwa i Melioracji AR, Szczecin, Poland). **Wplyw zawartosci wegla organicznego w glebie i temperatury na dynamike zanikania nogosu 50 EC. [The effect of the organic carbon content of the soil on the rate of degradation of nogos 50 EC.]** *Zesz. Nauk. Akad. Roln. Szczecinie 38: 293-298; 1972.* (4 references) (Polish)

The effect of the soil organic carbon content and of temperature on the disappearance of Nogos 50 (dichlorvos, DDVP) was studied in four different types of soils with organic carbon contents of 0%, 1.05%, 1.68%, and 4.75% at 15 C and 45 C. The disappearance of DDVP was nearly a linear function of time. The rate of degradation increased with the soil organic content and temperature. The half life of DDVP, as determined for 15 C and 45 C temperatures, was 6-7 days and 3-4 days, respectively.

See also **74-1788 74-1866 74-1889 74-1892 74-1926 74-1941 74-1965 74-2030**

74-1865. Senewiratne, B.; Thambipillai, S. (Dept. Med., Univ. Ceylon, Peradeniya, Ceylon). **Pattern of poisoning in a developing agricultural country.** *Brit. J. Prev. Soc. Med. 28(1): 28,32-36; 1974.* (12 references)

Four hundred and seventy-two cases of poisoning were seen over a 2-year period in Kandy, Ceylon. The overall mortality rate was 23.7%. The pattern of poisoning was different from that in western countries in that 49.8% of the cases were due to insecticide poisoning and only 10.7% were due to drugs, including barbiturates. Of the 112 fatal cases, insecticides accounted for 73.2%, while drugs accounted for only 4.5%. Rat poison accounted for an additional 5.3% of the poisonings and 3.6% of the fatalities. Of the two main groups of insecticides used in Ceylon (the organophosphates and the halogenated hydrocarbons), the halogenated hydrocarbons constitute a greater danger because of the absence of antidotes which are effective against them. The number of poisonings indicates a need for a poison center, the cost of which would be relatively low compared with the cost of the loss of young and useful lives.

74-1866. Lewis, T.; Nortón, G. A. (Commonwealth Inst. Biol. Control, Curepe, Trinidad). **Aerial baiting to control leaf-cutting ants (Formicidae, Attini) in Trinidad. III. Economic implications.** *Bull. Entomol. Res. 63(2): 289-303; 1973.* (23 references)

Aerial baiting to control leaf-cutting ants could result in adverse effects on wildlife. Insectivorous lizards and land crabs were counted at intervals after baiting trials, and no adverse effects on numbers or breeding were noted. Traces of aldrin and mirex were detected in the lizards, and even smaller amounts in the land crabs. The amounts of insecticide applied by aerial baiting would be less than those applied by the on-farm aldrin method: the total amount used would decrease from approximately 1000 kg of active ingredient annually to an estimated 450 kg. The environmental advantages of the smaller amounts applied might be offset by the far greater area contaminated with small amounts of aldrin. The long-term effects of aerial baiting on predatory birds are unknown, but harmful effects are unlikely to occur at the low application rate. Dropping of bait on houses, where it could contaminate domestic water collected from roofs, should be avoided. Under the worst possible circumstances, an individual might consume 18 g of aldrin over a 2-3 week period via his water supply; this is well below the established no-effect level. Hens probably would not accumulate lethal residues from bait particles, but could develop tissue residues, and thus should be kept from baited areas.

74-1867. Jirasek, L.; Kalensky, J.; Kubec, K. (Second Dermatologic Clinic, FVL KU, Prague, Czechoslovakia). **Acne chlorina a porphyria cutanea tarda pri vyrobe herbicid. [Chloracne and porphyria cutanea tarda during the manufacture of herbicides.]** *Cesk. Dermatol. 48(5): 306-317; 1973.* (49 references) (Czech)

Seventy-eight cases of chloracne and porphyria cutanea tarda occurred during the manufacture of pentachlorophenol and 2,4,5-T derivatives. The conditions were caused by the formation of 2,3,6,7-tetrachlorodibenzodioxin during alkaline hydrolysis of tetrachlorobenzene to sodium trichlorophenolate under inadequate reaction conditions (at 190 C temperature instead of 153 C). Chloracne was usually mild, characterized only by comedones. Severe cases were associated with large cysts, abcesses and scars on the whole body. Twelve patients had hepatic lesions with symptoms of porphyria cutanea tarda, and some patients had nervous and mental disorders. Maintenance workers and research workers were affected as well as workers engaged in herbicide production. In six cases chloracne began as acute solar dermatitis; in all other cases it started by a slow eruption of comedones and their development into cysts. Inflammation and scarring were found in the most serious cases only. In 17 cases chloracne started by papulopustulous eruptions on the extremities. Acne was localized in the maxillae in 20 cases. Patients with impaired porphyrin metabolism suffered from typical hyperpigmentation and hypertrichosis, and only one from bullosis actinica et mechanica. Hypertrichosis and hyperpigmentation were also observed in 19 patients with acne without porphyria. No predisposing factors were detected. After peaking out usually after 1 to 2 years the disease recedes very slowly. However, the symptoms of general poisoning have persisted for 8 years in some patients. A certain improvement was obtained by regular expression of comedones and sauna.

74-1868. Salisbury, B. G.; Tate, C. F., Jr.; Davies, J. E. (Dept. Med., Pulmonary Dis. Div., Univ. Miami Sch. Med., Miami, FL). **Baygon-induced pulmonary edema.** *Chest 65(4): 455-457; 1974.* (10 references)

A 39-year-old black woman was brought to the emergency room in a coma with labored respiration, white frothy secretions bubbling from the mouth, pinpoint pupils, bilateral coarse inspiratory rales anteriorly and posteriorly, and inspiratory and expiratory wheezes and rhonchi. Toxicologic studies of the gastric aspirate revealed the presence of Baygon (propoxur) and its major metabolite (2-isopropoxyphenol). Primary therapy consisted of endotracheal intubation, vigorous and frequent suctioning, oxygen therapy, i.v. administered bicarbonate and aminophylline. After 12 hours of therapy, the lungs were clear to auscultation except for minimal bilaterial inspiratory and expiratory wheezes, and after 18 hours, there was marked resolution of the pulmonary edema. On regaining consciousness, the patient claimed to have ingested the insecticide in attempted suicide. In general, therapy of propoxur-induced pulmonary edema is based on supportive measures until the results of the toxicology studies are known. Once these results are known, the administration of atropine and/or 2-PAMCI may be indicated, although they were not used in this case.

74-1869. Sidell, F. R. (Clin. Invest. Sect., Clin. Res. Branch, Med. Res. Div., Biomed. Lab., Edgewood Arsenal, MD). **Soman and sarin: clinical manifestations and treatment of accidental poisoning by organophosphates.** *Clin. Toxicol. 7(1): 1-17; 1974.* (20 references)

Four cases of poisoning with sarin and one with soman are described. One patient, accidentally splashed with soman, had lingering psychiatric sequelae after apparent recovery; scopolamine alleviated these symptoms. Iabrogenic complications of the vigorous therapy in this patient included urinary retention due to excessive atropine dosage and infection following catheterization. A second worker developed respiratory distress after cleaning a sarin-contaminated area. EKG abnormalities persisted for four weeks after recovery from the acute poisoning effects. Psychiatric evaluation after six months revealed persisting depression. The patient died of acute myocardial infarction 18 months after sarin exposure. Three men working in a room where sarin was stored developed mild symptoms and were kept under observation for 6 hr without treatment. They were asymptomatic upon discharge except for eye irritation and poor vision in dim light. Complete recovery of dark adaptation ability took two months in these patients.

74-1870. Alix, B.; Courtadon, M.; Jourde, M.; Chone, A. F.; Jallut, H. (Author address not given). **Pericardites aigues benignes provoquees par l'inhalation de pesticides–a propos de 2 observations. [Acute benign pericarditis by pesticide inhalation–in relation to 2 cases.]** *Coeur Med. Interne 13(1): 165-169; 1974.* (11 references) (French)

Two cases of acute benign pericarditis with favorable outcome are reported. One case was due to the inhalation of MCPA and the other due to that of a mixture of lindane and a copper compound. In one case, thoracic pain, dyspnea, asthenia, retrosternal pain, pericardial fremitus, and repolarization troubles developed 12 hr after MCPA inhalation. In the other cases, with allergic predisposition, the latency time was 8 days. Thoracic pain, febrility, cough, dyspnea, cervicalgia, scapulalgia, pericardial fremitus, and reduction of the cardiac kinetics were observed in this case. Previous contacts with the respective pesticides were established in both cases. Both cases were diagnosed as allergic pericarditis, the first two cases among a total of 15 cases known from literature to be due to pesticide inhalation.

74-1871. Garrett, R. L. (Univ. California, Davis, CA 95616). **Effect of technical DDT on eggshell structure in coturnix quail (*Coturnix coturnix*) and brown pelicans (*Pelicanus occidentalis*).** *Diss. Abstr. Int. 34(10): 5254B; 1974.*

Brown pelican (*Pelicanus occidentalis*) eggs collected from areas of high and low levels of environmental DDT contamination (10.5 ppm and < 0.02 ppm in prey species) were examined for aberrations in eggshell structure using the scanning electron microscope (SEM). Additionally, eggshells of coturnix quail (*Coturnix coturnix*) exposed to three levels of DDT [5, 25, and 225 ppm technical DDT in diet] were examined. Measurements of eggshell structure are reported. A comparison of brown pelican and coturnix structure concluded with the following results: that brown pelican and coturnix quail eggshells were shown to differ ordinally but in most characteristics were strikingly similar; that "normal" eggshells of brown pelicans and coturnix quail were shown to exhibit average shell layer thicknesses which were essentially constant between eggs of the same species–in short, providing a potentially valuable comparative basis for future studies; that brown pelicans and coturnix quail exposed to similar levels of DDT in prey species and experimental diets produced eggshells with similar structural aberrations; that premature termination of the egg was not the cause of eggshell thinning in brown pelicans or coturnix quail; that DDT causes a disruption of mucoprotein deposition in eggshell membranes; and that DDT disrupts the formation of "foundation stones" which are believed to control subsequent calcareous deposition in avian species. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 74-8507.)

74-1872. Anomymous. **EPA issues re-entry standards: the lawyers triumph again.** *Farm Chem. 137(4): 16-17; 1974.*

EPA has announced that no farm worker will be allowed to enter a field treated with a pesticide until 12 hours after application unless wearing protective clothing. Also, for 13 specified pesticides, no one may re-enter without protective clothing for 48 hours. When a worker will have foliar contact for more than one half hour per day, protective clothing must be worn for the full harvest interval. The stated harvest entry times represent the times between application of a pesticide on a food crop and harvest needed to achieve acceptable tolerance residues. However, there is no basis for stating that the same intervals must be observed by workers merely coming into contact with the crops. There is still serious question as to whether there is any need for re-entry standards at all. To prevent these unsound proposals from becoming permanent standards, strong protest from everyone concerned should be submitted to EPA by April 12, 1974.

74-1873. Hertel, W. (Author address not given). **Neufestsetzung von Rueckstandswerten: Auswirkungen auf den Getriedesektor. [Adjustment of allowable residue levels; its impact on the grain processing industry.]** *Getreide Mehl 27(2): 51-52; 1973.* (German)

Proposals for the modification of 1968 Pesticide Residue Act in West Germany concerning grain, flour,

and related products are presented. Zero tolerance for banned pesticides such as aldrin, dieldrin, and chlordane, and for arsenic and organomercurial pesticides at the respective limits of detectability is proposed. With a few exceptions the same tolerance is proposed for grain and flour. The maximum allowable concentrations being proposed are 0.1 ppm for arachlor, barban, buturon, dichlorprop, monolinuron, naled, lindane, and hydrogen phosphide; 0.01 ppm for BHC; 0.2 ppm for linuron, trichlorobenzoic acid, and demeton derivatives; 3 ppm for malathion and pyrethrin; 10 ppm for piperonyl butoxide; and 50 ppm for inorganic bromides.

74-1874. Pokornts, Ya.; Kulikova, Kh. (Dept. General and Communal Hyg., Inst. Hyg. Epidemiol., Prague, Czechoslovakia). **Vliyaniye pestitsidnykh preparatov na kachestvo vody vodoyemov. [Effects of pesticides on reservoir water.]** *Gig. Sanit. 39(1): 89-91; 1974.* (Russian)

Studies on the effects of pesticides on the organoleptic and biological properties of reservoir water and on general analytical methods are reviewed. Pesticides may contaminate reservoirs by infiltration or washout from treated farm lands, or by being discharged by pesticide manufacturing plants. Pesticides in water can be determined by colorimetry, gas chromatography, and thin-layer chromatography following extraction and concentration by means of activated carbon or by biological methods using algae, phytoplanktons, and fish as indicators. The odor threshold of most of the pesticides in water lies below 1 mg/liter; that of the major organochlorine pesticides varies from 0.13 μg/liter to 22 mg/liter; that of the major organophosphorus pesticides from 0.2 μg/liter to 1 mg/liter. Phenoxyacetic acid derivatives have odor thresholds ranging from 3 μg/liter to 3 mg/liter. The maximum allowable concentration of most of the pesticides, as determined by biological tests, lies below 1 mg/liter, but is as low as about 0.01 mg/liter for such preparations as atrazine, thiometon, and malathion. Bacteria are much more resistent to pesticides than plankton and fish. *Agrobacterium* spp. decomposed dalapon and *Pseudomonas fluorescens* decomposed atrazine.

74-1875. Burkatskaya, Ye. N.; Tsapko, V. G. (Inst. Occup. Hyg. and Occup. Dis., Kiev, USSR). **Voprosy gigiyeny truda pri razlichnykh sposobakh primeneniya pestitsidov v sel'skom khozyaystve. [The problems of industrial hygiene in case of different means of use of pesticides in agriculture.]** *Gig. Sanit. 39(3): 19-21; 1974.* (17 references) (Russian)

Sanitary hygienic studies on the occupational hazards occurring during different modes of pesticide use and application are presented. Seed dressing should be done in centralized, airtight equipment by the wet method to prevent air pollution by seed dressing agents. Pilots and tractor drivers are exposed to high pesticide concentrations, noise, vibration, and high temperature. Trichlorfon potentiated the effect of noise in rats. Therefore, aircraft and tractors should be equipped with airtight cockpits and cabins, respectively, as well as with air purifying and air conditioning devices. The application of pesticides of finely dispersed aerosol by a new method is hazardous due to skin resorption and inhalation of such aerosols.

74-1876. Mukhtarova, N. D.; Kulagina, T. P. (Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Kliniko-entsefalograficheskiye paralleli pri khronicheskom vozdeystivii na organizm cheloveka nebol'shikh doz etilmerkurkhlorida. [Clinico-encephalographic parallels in chronic exposure of the human organism to the effect of small doses of ethylmercury chloride.]** *Gig. Tr. Prof. Zabol. 17(6): 26-30; 1973.* (7 references) (Russian)

Comparative clinical and encephalographic investigations are described for 25 subjects in the 26-55 yr age bracket chronically exposed to low oral doses of ethylmercury chloride. Asthenovegetative syndrome in 8 cases, encephalopathy with involvement of the diencephalic region in 5 cases, encephaloradicular polyneuritis in 4 cases, and encephaloradicular polyneuritis with involvement of the diencephalic region in another 8 cases were diagnosed. In one group with predominant lesion of the mesodiencephalic region electroencephalographic examinations revealed the absence of normal EEGs, disruption of the cortical-subcortical links, and pronounced disorganization of the basic rhythm. Another group including cases of asthenovegetative syndrome and encephaloradicular polyneuritis demonstrated moderate diffuse changes in the brain bioelectric activity with certain degree of disorganization of the basic rhythm and predominance of low-amplitude slow waves. Monomorphic nature of the abnormal activity, increased proportion of polyrhythmic EEG, as well as low frequency and amplitude of the basic rhythm were determined. The degree of the nervous system involvement and the intensity of the electrographic changes were related.

74-1877. Goldmann, P. J. (Badische Anilin- u. Soda-Fabrik AG, Aerztliche Abteilung, Ludwigshafen am Rhein, Germany). **Schwerste akute Chlorakne, eine Massenintoxikation durch 2,3,6,7-Tetrachlorodibenzodioxin. [Severe acute chloracne, a mass epidemic caused by 2,3,6,7-tetrachlorodibenzodioxin.]** *Hautarzt 24(4): 149-152; 1973.* (3 references) (German)

The clinical picture and the etiology of a severe acute chloracne epidemic are described. The incident involved 55 workers at BASF in 1953 and was caused by inhalation of organochlorine vapors as a result of an unpredictable chemical reaction. The toxic agent was 2,3,6,7-tetrachlorodibenzodioxin in 44 cases, 14 of which had damages to the inner organs and central

nervous system, myocarditis, hepatitis, tracheobronchitis, nephrosis, rheumatic mitral stenosis. Severe hemorrhagic pleuritis, necrosis of the pancreas, splenitis, laryngitis, dyspepsia, toxic polyneuritis (hyporeflexia, hyperalgesia, hypotonia), asthenia, peripheral paresis of the olfactory nerve, anosmia, gingivitis, stomatitis, duodenal ulcers, disseminated encephalitis, chronic conjunctivitis and plepharitis, sensory and motor paresis of the extremities, sensory troubles, rheumatism of the extremities, and schizophrenia were some of the immediate and protracting symptoms. Tests performed on rabbits showed that 2,3,6,7-tetrachlorodibenzodioxide is 10,000 times more toxic than hexachloronaphthalin.

74-1878. Mihail, G.; Zlavog, A.; Anghelache,V.; Bodnar, J. (Inst. Sanatate Publica Cercetari Medicale, Iasi, Rumania). **Ornitincarbamiltransferaza serica, test de evaluare a modificarilor hepatice determinate de unele toxice industriale. [Serum ornithine carbamoyltransferase, test for evaluating hepatic alterations caused by some industrial toxic substances.]** *Igiena 21(5): 267-276; 1972.* (14 references) (Rumanian)

The serum OCT (ornithine carbamoyltransferase) was studied in workers exposed to organochlorine insecticides, carbon disulfide, and some solvents used in synthetic rubber production. Occupational contact with organochlorines for more than five years was correlated with a significant increase in serum OCT levels. DDT exposure produced greater OCT elevations than exposure to BHC. Progressive increases in OCT levels in workers exposed to carbon disulfide for more than 6 months resembled the increases seen in persons who developed polyneuritis. The OCT activity increases detected after exposure of rabbits to lindane, carbon disulfide, and thiram were accompanied by slight liver damage. The OCT test, because of its sensitivity, seems suitable for medical monitoring in industries where a hepatologic risk is presented by the products handled.

74-1879. Manescu, S.; Petre, I. (Inst. of Public Hygiene and Sanitation, Bucharest, Rumania). **Aspecte epidemiologice ale poluarii accidentale a apei cu substante chimice. [Epidemiological aspects of accidental water pollution with chemical substances.]** *Igiena 21(7): 387-392; 1972.* (12 references) (Rumanian)

The importance of controlling water pollution from chemical substances and the characteristics of several micropollutants are discussed. Seventeen poisonings occurring over the last few years were analyzed epidemiologically to study the main pollutants, the sources of pollution, symptoms, and treatment. Statistics showed that pesticides were the most common pollutants. Of the poisonings six cases were caused by negligence (improper handling, storage, or use of toxic materials); another six were caused by leaching from a disposal site after a rainfall raised the water level; and five were caused by malfunction of industrial waste treatment facilities. The pesticides involved included dibutan, lindane, BHC, and other organochlorine pesticides and nitroderivatives. Symptoms were mostly gastrointestinal related and included nausea, vomiting, and anorexia. Supplementary investigations were undertaken to correct the situation and to prevent further poisoning.

74-1880. Utadjian, H. M. D. (Author address not given). **Criteria for a recommended standard...occupational exposure to inorganic arsenic.** *J. Occup. Med. 16(4): 264-269; 1974.*

The National Institute for Occupational Safety and Health recommends that worker exposure to arsenic and its inorganic compounds (with the exception of arsine and lead arsenate) be controlled by required compliance with regulations pertaining to environmental concentration, sampling and analysis, and medical surveillance. The standard is designed to protect the health and safety of workers for a 40-hour week over a working lifetime. The major route of arsenic excretion is through urine but the interpretation of urinary data is difficult. Monitoring urinary arsenic cannot replace monitoring atmospheric concentrations to determine worker exposure. Symptoms of arsenic poisoning include: nausea, vomiting, diarrhea, dermatitis, hyperpigmentation, hyperkeratosis, peripheral neuropathy, changes in the ECG, anemia, leucopenia, cirrhosis, enlargement of the bile duct, fatty degeneration of the liver, and cancer. Arsenic appears to be an occupational carcinogen. The present Federal standard for arsenic and compounds is 0.5 mg As/m^3 as a time-weighted average which is too high. The standard should be set at least as low as 0.05 mg As/m^3. Exposure at this level should reduce the incidence of arsenic-induced cancer.

74-1881. Bishun, N. P.; Raven, R. W.; Williams, D. C. (Res. Dept. Marie Curie Mem. Foundation, The Chart, Oxted, Surrey, Great Britain). **Chromosomes and cancer.** *J. Surg. Oncol. 163-181; 1974.* (51 references)

It has become obvious in recent years that a number of chemical, physical, and other agents to which humans are exposed are capable of damaging chromosomes. Recent epidemiological evidence from mutagen exposed human populations and recent experiments on virus-induced transformation of chromosomally abnormal cells suggest an association between chromosome aberrations and oncogenesis. For example, DDT is mutagenic, produces tumors in animals, and also produces chromosomal abnormalities. The past half century has seen substantial increases in the use of drugs, food additives, pesticides, and other environmental chemicals. Chromosomal studies and evaluation of the mutagenic potential of all such chemicals should be integral aspects of the evaluation of their safety. Persons exposed to high risk should be offered routine chromosomal monitoring, and the appearance of adverse effects and abnormalities noted and correlated.

74-1882. Warner, R. W. (Natl. Field Investigations Ctr., EPA, Denver, CO). **Water pollution: freshwater macroinvertebrates.** *J. Water Pollut. Contr. Fed. 45(6): 1231-1237; 1973.* (69 references)

The effects of inorganic and organic wastes, pesticides, radiation, and alterations in the physical environment on freshwater macroinvertebrates are reviewed. Consideration is also given secondary production, periodicity and drift, distribution and habitat requirements, and investigative techniques. With regard to pesticides, various researchers have investigated: the pesticide concentrations needed to immobilize various species; the comparative toxicities of the various compounds for different species; factors governing individual sensitivity to the different pesticides; the uptake and accumulation of pesticides by aquatic invertebrates; the effects of various pesticides on different components of a species population; and the effects of pesticides on brain biochemistry and behavior.

74-1883. Hanyu, I.; Tsuji, T. (Ibaragi Prefectural Mizukaido Health Center, Ibaragi, Japan). **[Results of investigation on the effects of agricultural chemicals, especially organophosphorus pesticides, on farmers' health.]** *Koshu Eisei Joho (Pub. Health Inform.) 4(2): 20; 1974.* (Japanese)

A health investigation was carried out in March 1973 on 16 men and 9 women from 11 agricultural homes mainly engaging in rice and vinyl green house culture for vegetables. Medical history, physical and medical examinatons including blood, urine, and anemia examinations, liver function, ChE activity, serum albumin, rheumatoid factor, ECG, and fundus examinations were performed. Cultivation methods, crop area, farming days, pesticides applied (kinds and rate), methods of protection, sleeping hours and food intake were considered. Complaints of subjective symptoms included 16 with symptoms of lumbago, shoulder discomfort, and dimness of vision (in many cases Daconil applicators). Hypertension was found in eight persons. Two men and five women had suspected anemia. Conjunctival hyperemia was found in nine persons. Some subjects showed weakened tendon reflex. Only one woman showed abnormal liver function. Thirteen people had a decreased serum albumin, and six people showed a moderate and 10 a slight decrease of serum ChE activity. None had rheumatoid reactions. ECGs showed 10 people with enlarged left ventricle. Only six people did not have anomalies of fundus; however, no correlation was found between the abnormality and the pesticide. Most had an ordinary working time of 7 hr/day in vinyl green house (area of 800-28000 m^2). The pesticides most frequently used were daconil (chlorthalonil) (4 kg) and karathane (dinocap) (1 kg) as fungicide, dichlorvos (1 kg), trichlorfon (1 kg), menazon (1 kg), and thiometon (0.5 kg) as insecticide once a week for a year. Five families out of 11 did not wear a mask and gloves. A marked decrease of ChE activity occurred where dichlorvos was used for fumigation.

74-1884. Doman, I. (Author address not given). **Wofatox-mergezes sertesekben. [Wofatox poisoning in swine.]** *Magy. Allatorv. Lapja 28(12): 696; 1973.* (Hungarian)

Symptoms of slight poisoning appeared in swine which had ingested cabbage treated with methyl parathion-containing Wofatox six days earlier. The first symptoms of poisoning developed in about 1.5 hr. Spasmophilia, irritability, tactile hypersensitivity, moderate salivation, emesis, and dyskinesia were observed. The animals were successfully treated with atropine sulfate.

74-1885. Simpson, G. R.; Penney, D. J. (Div. Occupational Health Pollut. Control, Dept. Health, New South Wales, Australia). **Pesticides poisonings in the Namoi and Macquarie Valleys, 1973.** *Med. J. Aust. 1(8): 258-260; 1974.* (3 references)

The Australian Agricultural and Veterinary Chemicals Association published a code of practice for the safe handling of pesticides during aerial operations. In accordance with this code, blood cholinesterase tests were conducted at monthly intervals during the spraying season. Blood tests of persons exposed in January were satisfactory. However, at the end of January indiscriminate and heavy spraying was instituted to combat a large infestation of *Heliothis* threatening the cotton crops. Numerous cases of organophosphate and some case of carbamate poisoning resulted. Persons with blood cholinesterase levels less than 35% were hospitalized; persons with levels between 35 and 60% were advised to avoid further exposure until their blood values returned to 80% or better. Using a carbamate and organophosphate material simultaneously complicated the toxicity problem and diagnosis. Treatment included atropine and pralidoxime administration. Many of the more serious poisonings occurred as a result of exposure to mevinphos with mixers being the most affected. Methomyl poisonings probably occurred as a result of powder inhalation during mixing. The use of protective clothing reduced exposure considerably. Routine blood tests and the code probably averted further injuries.

74-1886. Hirono, K. (Dept. Internal Med., Niigata Rinko Hospital, Niigata, Japan). **[Clinical and experimental studies on pneumonitis caused by pesticides. Part 1. Clinical study.]** *Niigata Igakkai Zasshi (Niigata Med. J.) 88(2): 64-69; 1974.* (15 references) (Japanese)

Cases of respiratory disturbances involving an antibiotic fungicide, Blasticidin-S (its benzylaminosulfonate) and other pesticides are described. The first instance stemmed from group application of Blasticidin-S on paddy field by 30 persons with application time of 30, 60, and 120 min. Pains in the pharynx in 15, headache in 9, nausea in 5, abdominal pains in 10, eye disturbance in 2, coughing in 13, dyspnea in 5, pyrexia in 4, and dermatitis in 7 occurred. Chest roentgenography was

carried out on 12 of 22 persons and abnormal density was found in eight patients; hospitalization of three serious cases resulted. The hospital histories of the three patients are described in detail; pre-hospitalization symptoms included vomiting (2/3), photophobia, lachrymation (3/3), cough (2/3), pyrexia (3/3), and diarrhea. All showed increased pulmonary markings and spot-like shadows in roentgenography. These anomalies were cleared up completely or partly. Negative results were obtained with patch tests with Blasticidin-S. Another case of intoxication due to γ-BHC plus dichlorvos showed pulmonary markings and two cases in which the already existing respiratory diseases were aggravated by pesticide(s) are described. One of the two cases involved tuberculosis; the other case changed from bronchiectasis to interstitial pneumonia, by Blasticidin-S plus PMA and PCP. The abnormal density on chest roentgenogrpahy due to pesticides was dense enough to be discovered easily.

74-1887. Oto, K. (Dept. Ophthalmol., Asama City Hospital, Saku, Nagano, Japan). **[Long-term followup study of chronic pesticide intoxications in Saku region with special reference to retinal pigmentary degeneration.]** *Nippon Ganka Gakkai Zasshi (J. Jap. Ophthalmol. Soc.) 78(5): 237-243; 1974.* (43 references) (Japanese)

Ophthalmologic examinations were performed on twelve children, average age 7.7 years, who had been diagnosed as chronic organophosphate pesticide intoxication cases and had not been treated or hospitalized. The visual acuity ranged from 0.1-10, with corrected values of 0.3-1.0. The visual field ranged from 95° to 40° peripherally and 67° to 35° centrally. The refractive error generally entailed nearsightedness, with some exceptional instances of hypermetropia and compound astigmatism. The erythrocyte cholinesterase level ranged from 2.72 to 1.18 (average 1.84). The total organophosphate content of the blood was 0.02-0.3 ppm. The fundus findings included serious nerve papilla abnormalities, i.e., congestion, annular conus, and paleness. Arterial constriction and generalized turbidity were seen. The low amplitude of α- and β-waves, increased latency period, and prolonged α-intervals seen in the ERG resembled the findings in Wistar rats experimentally intoxicated with fenthion. The disease thus seems to progress from disturbances of the choroid vessel through changes in the pigmentary epithelial cells, optic cells, and ganglionic cells, to disappearance of the ERG, and involved a special type of retinal pigmentary degeneration. Treatment with pralidoxime and atropine alleviated the abnormalities.

74-1888. Yamashita, K.; Aoyama, S.; Ikuta, S.; Miyake, T.; Arima, K. (School of Pathol, Fac. of Med., Yamaguchi Univ., Yamaguchi, Japan). **[A case of acute intoxication and autopsy, due to paraquat-dichloride: comment on comparison between the injury by insecticide and herbicide.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 23(1): 27-38; 1974.* (17 references) (Japanese)

A man 31 years old committed suicide by swallowing a "sake" cupful (about 10 ml) of technical paraquat dichloride (24%) after taking some glassfuls of sake. The symptoms appeared as vomiting, diarrhea, and complaints of general malaise. After hospitalization the next morning with slight miosis, intravenous administration of pralidoxime and intramuscular injection of atropine were repeated three times every 30 min, with drip of glucose plus Vitamin B1, B2, B6 and C because the substance he had taken was unknown. During the drip he began convulsions and gradually stopped breathing; cardiac arrest followed. The time from herbicide ingestion to death was about 12 hr. The clinical data just after hospitalization were: blood pressure 140-82 mmHg, Hb 118%, RBC 49 X 10^4, WBC 29400 (St. 12%, Seg. 75%, Mon. 2%, Lym. 11%), TTT 3.3, ZTT 11.2, Alkphos 11.8, LDH 740, GOT 200, GPT 75, ChE 1.04, serum total protein 8.4 g/dl, A/G 1.55, and BUN 18. ECG, roentgenography, and urinalysis could not be carried out. At autopsy, the contents of stomach and duodenum, liver and kidney extracts showed paraquat dichloride by TLC. The major findings of autopsy were: denaturation and necrosis of adrenal cortex, gastrointestinal catarrhal inflammation and erosion, fatty degeneration and focal necrosis of liver, denaturation and necrosis of epithelium of renal tubules, chronic inflammation and erosion of bladder, denaturation of medullary sheath and of axon of peripheral nerves, vacuolation of nerve cells, atrophy of muscles of internal organs, hemorrhagic changes of lung, spleen, epiglottis, brain stem, medulla dorsalis, stomach, and external pericardium, and stagnation and hydropsic state of general organs.

74-1889. Wakatsuki, S. (Japan Society for Rural Medicine, Tokyo, Japan). **[Investigation and studies on the diagnosis and therapy of pesticide intoxication.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 23(1): 62-67; 1974.* (Japanese)

The article consisted of three sections: (1) collecting and analyzing the information concerning acute and chronic intoxication due to pesticides; (2) investigation of pesticide residues in humans and experimental studies on the onset of symptoms of the intoxication; (3) studies on the therapy of intoxication due to several pesticides. The first section was subdivided into three areas: (1) investigation of clinical cases of pesticide intoxication; (2) investigation on the health state of persons who have engaged in pesticide application; and (3) investigation and studies on dermatitis due to pesticides by patch test. The second was also subdivided into three sections: (1) analysis of residual organochlorine pesticides in human body; (2) allergologic study on the intoxication due to organomercury pesticides; and (3) electronmicoscopic studies on various internal organs in

the cases of experimental subacute intoxication by organophosphorus compounds. The last section was subdivided into two: (1) electroencephalographical studies on intoxicated persons and experimentally poisoned animals and (2) investigation of the acutal states of ocular disturbances due to organophosphorus pesticides and etiological studies on the problems by animal experiments.

74-1890. Warabioka, K. (Cancer Institute, Japanese Foundation for Cancer Research, Tokyo, Japan). **[Problems in toxicity tests of chemical compounds including pesticides—a few considerations on the tests for carcinogenicity, mutagenicity and teratogenicity.]** *Noyaku Kagaku (J. Pestic. Sci.) 1(4): 143-158; 1974.* (11 references) (Japanese)

Following the model datasheet for a new pesticide given by the Council of Europe-1969, what the toxicity test should be is described using the long-term toxicity test, and tests for carcinogenesis, mutagenesis, and teratogenesis (consecutive generations). The information is based on a notice from the Ministry of Agriculture and Forestry concerning the registration of a new pesticide from the viewpoint of toxicity and persistence. The notice was issued following WHO's Technical Report No. 144 which was issued as a means of establishing the safety of food additives by an FAO/WHO joint expert committee and modified for specific pesticides.

74-1891. California Department of Public Health (Berkeley, CA 94704). **Occupational disease in California attributed to pesticides and other agricultural chemicals.** *Bureau of Occupational Health and Environmental Epidemiology, Berkeley, 1970, 31p.*

In 1970, there were 1493 reports of occupational disease attributed to pesticides and other agricultural chemicals in California, the number of cases having increased by 32% between 1969 and 1970. The increased number of reports reflects a series of pesticide poisoning outbreaks in 1970 among citrus pickers and other farm laborers in the San Joaquin Valley. Residues of several organophosphorus compounds on foliage were responsible. In agricultural services, the rate of occupational disease reports due to agricultural chemicals was more than double that for all workers in agriculture. Since 1951, there have been 36 occupational fatalities attributed to agricultural chemicals. In this same period pesticides and other agricultural chemicals were implicated in the accidental deaths of 93 children and 38 adults in nonwork situations. Organophosphorus pesticides were implicated in 22% of the 1493 reports of occupational illness attributed to agricultural chemicals. Herbicides were implicated in 14% of the cases, and halogenated hydrocarbon pesticides were implicated in 6%. About 141 million pounds of active pesticidal materials were applied in California in 1970, 126 million pounds for agricultural purposes alone. Recent California regulations and legislation concerning pesticide controls are noted.

74-1892. Blus, L. J.; Belisle, A. A.; Prouty, R. M. (U.S. Dept. Inter., Bur. Sport Fish. and Wildl., Patuxent Wildl. Res. Cent., Laurel, MD 20810). **Relation of the brown pelican to certain environmental pollutants.** *Pestic. Monit. J. 7(3/4): 181-194; 1974.* (56 references)

Nearly all brown pelican eggs collected from 13 colonies in South Carolina, Florida, and California in 1969 and from 17 colonies in South Carolina and Florida in 1970 exhibited eggshell thinning. Of the 100 eggs analyzed for residues of pollutants, all eggs contained measurable quantities of DDE; most eggs contained measurable quantities of *p,p'*-DDD (TDE), *p,p'*-DDT, dieldrin, or PCBs (polychlorinated biphenyls). All eggs contained measurable quantities of mercury. DDT appears to have been responsible for virtually all the eggshell thinning. There is strong evidence that DDE played a major role in lowered reproductive success in South Carolina and California, and this pollutant appears to be intimately related to the population decline in South Carolina. Other pollutants, particularly dieldrin, may have had deleterious effect on reproductive success in South Carolina. Carcasses of pelicans collected by shooting in Florida and South Carolina in 1970 varied in residue load according to age and geographic location. Birds under 1 year of age contained smaller quantities of residues than did birds 1 year or older (Author abstract by permission)

74-1893. Anonymous. **Produits de traitement des semences de cereales, substances utilisees contre les rongeurs des champs et protection du gibier. [Seed dressings, rodenticides, and game protection.]** *Phytoma 24(234): 33-35; 1972.* (French)

The use of seed dressing agents and rodenticides is discussed with respect to game protection. Aldrin and dieldrin are not authorizied for use as seed dressing agents due to their high toxicity to game. Dressed seeds should be sown deep rather than on the surface. Rodenticides, such as the highly toxic zinc phosphide and crimidine, should be placed in the holes and caves of the rodents, inaccessible to game. Chlorophacinone, of reduced toxicity for game, can be applied on the surface.

74-1894. Lorgue, G.; Delatour, P. (Author address not given). **Les intoxications aigues chez le chien. Bilan de 15 mois d'analyses. [Acute poisonings of dog. A 15 months balance-sheet.]** *Rev. Med. Vet. (Toulouse) 124(10): 1211-1218; 1973.* (9 references) (French)

Results of analyses of 95 cases of acute isonings in dogs are presented. Strychnine, metaldenyde, and crimidine, a pyrimidine-derived rodenticide, are the most frequent causes of both accidental and intentional poisoning. The poisoning symptoms produced by all

three poisons are basically similar, such as muscular tremor, hyperreflexia, generalized myoclonia, salivation, mydriasis, convulsions, and death due to respiratory arrest and asphyxiation. Emetics, purgatives, diuretics, and anesthetics are used for therapy.

74-1895. Yost, J. F. (Cyanamide International Agricultural Research and Development, Princeton, N.J.) **Investigacion y desarrollo de los pesticidas. [Research and development of pesticides.]** *Rev. Vet. Venez. 32(190): 323-335; 1972.* (Spanish)

The procedure followed in research and development of pesticides from synthetization to practical application is described. Synthesis or selection, and preliminary studies on the mechanism of the biological action are the first steps in the development of new pesticides. Then, the biological activity spectrum as well as phytotoxicity and oral, dermal, ophthalmic, and cutaneous toxicity in animals are studied in pilot tests. If the findings of the above tests are satisfactory, the pesticidal efficiency; the formulation; metabolism in animal organs and tissues, soil, and water; the residue dynamics in tissues, soil, and water; and the effects on the organoleptic properties of the products to be treated are studied. The developmental studies are concluded with acute and chronic tests on rats and dogs for oral toxicity, teratogenicity, carcinogenicity, and genetic effects.

74-1896. Fujita, K. (Dept. of Ophthalmology, Saku General Hospital, Usuda-machi, Nagano, Japan). **[Ocular chemical burn by a herbicide, paraquat dichloride.]** *Rinsho Ganka (Clin. Ophthalmol.) 27(12): 1399-1401; 1973.* (10 references) (Japanese)

A 26-year-old man sustained ocular burns when a 24% aqueous formulation of paraquat dichloride splashed into his eyes while he was distributing the chemical into smaller containers. The victim's eyes were washed with water, and he was brought to the hospital on Aug. 12, 1972. Upon initial examination, the visual acuity in the right eye was 0.6 and in the left eye 1.2, both uncorrectable. Conjunctival edema and erosion of the entire cornea were observed in the right eye, with a more noticeable decrease in corneal sensation than in the left eye. Slight catarrhal conjunctivitis was present in the left eye. The skin of the eyelids showed slight redness without edema, and the vestibules were clear. For treatment, an antibiotic was administered systemically with topical application of Masui eyedrops and antibiotic ointment four times a day. After two weeks the corneal vital staining returned to normal, but other symptoms remained unchanged. After 16 days the lesions began to improve, and on Sept. 9, the subjective symptoms disappeared except for slight redness of the conjunctiva and visual acuity in the right eye of 1.2. However, the recovery of corneal sensation took a long time; it was the end of October before both sensations became equalized. No general subjective symptoms other than malaise and anorexia were noted, nor were any systemic abnormalities. Although paraquat dichloride was officially placed on the list of poisonous substances, its storage, application, and handling have been treated rather lightly.

74-1897. Tsyrkunov, L. P. (Kiev, Inst. Ind. Hyg. Occup. Dis., Kiev, USSR). **Issledovaniye pH poverkhnosti kozhi u bol'nykh professional'nymi dermatozami. [Changes in pH of the skin surface in patients with occupational dermatoses.]** *Vestn. Dermatol. Venerol. 47(7): 76-78; 1973.* (6 references) (Russian)

A shift in the acid-alkaline equilibrium of the skin surface towards alkalinity was determined by electrometric pH measurement of the skin on the upper limbs of patients with occupational dermatoses caused by benzene, kerosene, antibiotics, nickel and cobalt salts, resins, and thiuram. A statistically significant relationship between the pH values of the skin surface and the acuity of the inflammatory phenomena was established. The greatest changes in the functional status of the skin were observed in cases of dermatoses with marked exudative processes.

See also **74-1794** **74-1836** **74-1879**

74-1898. Szabo, E.; Berko, G.; Husz, S.; Simon, M. (Dept. Dermatol. Venereal Dis., Univ. Med. Sch., Szeged, Hungary). **Demonstration of tissue porphyrins in hexachlorobenzene model experiment by the fluorescence technique.** *Acta Morphol. Acad. Sci. Hung. 21(2): 155-163; 1973.* (25 references)

The fluorescence microscopy technique was used to study the distribution and localization of porphyrins in the tissues of rats in which porphyria had been induced by hexachlorobenzene treatment. As shown by a tissue diffusion inhibiting technique, the first morphological sign of increased porphyrin synthesis was the storage of porphyrins by RES cells in the lungs, liver, and gastrointestinal tract. The severity of the clinical and laboratory findings correlated with the porphyrin content of the different tissues. In massive porphyria cytoplasmic porphyrin autofluorescence was found in the hepatic and renal parenchyma. Disruption of the nuclear membrane was indicated by the occasional presence of porphyrins in the hepatocytes and endothelial cell nuclei.

74-1899. Szabo, E.; Husz, S.; Berko, G.; Simon, M. (Dept. Dermatol. Venereal Dis., Univ. Med. Sch., Szeged, Hungary). **Immunofluorescence studies in hexachlorobenzene model experiments.** *Acta Morphol. Acad. Sci. Hung. 21(2): 165-174; 1973.* (35 references)

The fluorescence antibody technique was used to study the effects of porphyrinogen material and porphyrin metabolites on hexachlorobenzene poisoned rats. The direct immunofluorescence method revealed the development of plasmophoresis following membrane lesions in the region of the blood vessels and renal parenchyma. In some cases, hyaline thrombus-like or cast-like formations filled the glomerular loops and convoluted tubules. A granular fluorescence indicating the binding of Ig complexes to tissues was lacking except in the blood vessels, renal parenchyma, and hepatic sinuses. Polyorgan-specific antibodies were occasionally found in low titers by the indirect immunofluorescence method. Immunoelectrophoresis showed no pathological immunoglobulin fractions. Hemopexin increased and haptoglobin decreased in about 80% of the animals, while the transferrin level showed similar decreases.

74-1900. Powers, J. M.; Hennigar, G. R.; Grooms, G.; Nichols, J. (Dept. Pathol., Med. Univ. South Carolina, Charleston, SC). **Adrenal cortical degeneration and regeneration following administration of DDD.** *Amer. J. Pathol. 75(1): 181-194; 1974.* (15 references)

Acute and chronic changes in the adrenals of young dogs were studied following the injection of single (200 mg/kg) or multiple (6 to 15, 100 to 200 mg/kg) doses of DDD (TDE). The degeneration of the adrenal cortical cells following DDD administration was rapid in onset and was dose related. It was morphologically characterized by profound cytoplasmic vacuolation due to severe mitochondrial changes, disruption of the smooth endoplasmic reticulum, autolysosomal response, and lipid accumulation. Toxic necrosis with a mononuclear cell reaction and fibrosis also occurred. The regeneration phase consisted of centripetal cellular regeneration, cellular repair, and some residual damage. The sensitivity of the adrenal cortex to DDD can be explained in terms of several characteristics: its lipid content, its high rate of blood flow, its unique intraadrenal vascularization, and its abundant mitochondria rich in susceptible enzyme systems.

74-1901. Towle, D. W.; Slate, N. M. (Univ. of Richmond, Richmond, VA). **A mechanism for DDT inhibition of *Fundulus* gill $Na^+ + K^+$-dependent ATPase.** *Amer. Zool. 12(3): 38; 1972.*

DDT inhibited the activity of $Na^+ + K^+$-dependent ATPase in homogenized gill preparations from the killifish *Fundulus heteroclitus*. The activity of $Na^+ + K^+$-dependent ATPase was inhibited 50% by 2.5 ppm DDT, while the activity of Mg^{2+}-dependent ATPase was inhibited only 8%. The maximum observed inhibition of $Na^+ + K^+$-dependent ATPase activity was 74% at 20 and 50 ppm DDT; the maximum inhibition of Mg^{2+}-dependent ATPase was 46% at 50 ppm. There was a competitive type interaction between K^+ and the DDT; the apparent *Km* for K^+ in untreated enzyme preparations was 3 m*M*, whereas the apparent *Km* for K^+ in the 5 ppm DDT-treated preparations was 25 m*M*. The inhibitory effect of 5 ppm DDT could be reversed nearly completely by increasing the K^+ concentration in the assay medium.

74-1902. Stanton, R. H.; Khan, M. A. Q. (Univ. Illinois, Chicago Circle, IL). **Oxidation of cyclodiene insecticides by sunfish, mouse and rat liver mixed-function oxidase.** *Amer. Zool. 12(3): 38; 1972.*

The in vitro metabolism of aldrin, chlordene, heptachlor, isodrin, and photoaldrin by the hepatic microsomal oxidase of bass, bluegill, mice, and rats was studied. Endrin was a potent inhibitor of oxidase activity. A new chlordene metabolite was discovered. The kinetics of competition between these cosubstrates will be reported. Intra- and interspecific differences in the mixed-function oxidase of fish were observed.

74-1903. Haider, K.; Jagnow, G.; Kohnen, R.; Lim, S. U. (Inst. Biochem. des Bodens und Inst. Bodenbiol. der Forschungsanst. fuer Landwirt., Braunschweig, Germany). **Abbau chlorierter Benzole, Phenole und Cyclohexan-Derivate durch Benzol und Phenol verwertende Bodenbakterien unter aeroben Bedingungen. [Degradation of chlorinated benzenes, phenols and cyclohexane derivatives by benzene and phenol utilizing soil bacteria under aerobic conditions.]** *Arch. Microbiol. 96(3): 183-200; 1974.* (51 references) (German)

The degradation of chlorinated benzenes, phenols, and cyclohexane derivatives by benzene- and phenol-utilizing *Nocardia* spp. and *Pseudomonas* spp., as well as by phenol- and phenolcarboxylic acid-utilizing *Arthrobacter* spp., all isolated from field, grassland, and forest soils, was studied in laboratory and field tests. The bacteria were precultivated on benzene or *p*-hydroxybenzoic acid, and then the compounds used were added. The compounds were labeled by ^{14}C, and their degradation rates were determined from the $^{14}CO_2$ release. *Pseudomonas* and *Nocardia* spp., precultivated on benzene, could also degrade the chlorinated derivatives of benzene and phenol. The monochlorinated derivatives were more easily degraded than the di- and trichlorinated derivatives. The chlorinated benzenes, especially when in higher concentrations, were degraded less easily than the chlorinated phenols were, but with lower concentrations their degradation rates were about similar, probably due to a higher toxicity of the benzenes. The phenol-utilizing *Arthrobacter* spp. were only able to degrade phenol and chlorinated phenols. Benzoic and *m*-chlorobenzoic acids were degraded to CO_2 by *Pseudomonas* and *Nocardia* spp. only. The benzene-utilizing *Pseudomonas* spp. released more CO_2 from gamma-pentachlorocyclohexane than from gamma-hexachlorocyclohexane (lindane), but none from cyclohexane. Upon precultivation of benzene-utilizing *Pseudomonas* spp. in glucose, the aromatic compounds were also degraded, but especially the chlorinated derivatives to a lower extent. Experiments with soil samples showed a degradation of all compounds which were used by the isolated organisms after variable induction periods. Cyclohexane was degraded slowly to CO_2 by the mixed soil flora in contrast to the benzene- and phenol-utilizing pure cultures.

74-1904. Rao, A. V.; Sethunathan, N. (Dept. Soil Microbiol., Central Rice Res. Inst., Cuttack-6, Orissa, India). **Degradation of parathion by *Penicillium waksmani* Zaleski isolated from flooded acid sulphate soil.** *Arch. Microbiol. 97(3): 203-208; 1974.*

By enrichment culture technique, a fungus *Penicillium waksmani* Zaleski which can degrade parathion was isolated from an acid sulphate soil under flooded condition. The fungus tolerated parathion at concentrations as high as 1000 ppm. Initially, medium containing parathion supported less growth but at later stages the growth was equal to that of control treatment. Parathion was converted to aminoparathion by the fungus. The increase in the radioactivity in the aqueous phase of the culture filtrate after solvent extraction indicated the formation of certain polar metabolites. (Author abstract by permission)

74-1905. Byczkowski, J. (Dept. Biochem., Med. Sch., Gdansk, Poland). **The effect of *p,p'*-DDT (Dicophane) and its main metabolites on the respiration of rat liver mitochondria.** *Arch. Toxikol. 31(2): 137-145; 1973.* (15 references)

The effects of DDT, DDE, DDOH, and DDA on the oxidation of NADH, glutamate, β-hydroxybutyrate, and succinate by rat liver mitochondria were investigated. DDT and all of its metabolites inhibited the oxidation of NAD-linked substrates by both intact and sonicated mitochondria. The water-soluble metabolites of DDT (DDOH and DDA) stimulated succinate oxidation by intact but not by sonicated mitochondria, and inhibited the activity of glutamate dehydrogenase. Thus, DDT and its metabolites may affect the mitochondrial respiratory chain between NADH and CoQ, inhibit glutamate dehydrogenase, and uncouple oxidative phosphorylation.

74-1906. Langhans, W.; Schimassek, H. (Inst. Biochem., Med. Fak., Univ. Heidelberg, Heidelberg, Germany). **Prevention of halothane induced changes in rat liver enzymes by 3-amino-1,2,4-triazole.** *Biochem. Pharmacol. 23(2): 403-409; 1974.* (6 references)

It has already been shown that 3-amino-1,2,4-triazole (amitrole) inhibits the biological transformation of halothane in liver. The results of this study indicate that inhibition of the transformation of halothane prevents some of the changes in liver metabolism observed after halothane treatment. Changes in enzyme activities were measured as sensitive indicators. Halothane and its stable metabolite trifluoroacetate greatly increased the activity of the mitochondrial glycerol-3-phosphate oxidase. Pretreatment of rats with aminotriazole inhibited the activity increase caused by halothane, but not by trifluoroacetate. Aminotriazole also prevented the increase in the activity of malic enzyme, NADPH-oxidase, and lactate dehydrogenase produced by halothane treatment. The induction of glycerol-3-phosphate oxidase could not be counteracted by actinomycin D because actinomycin itself increased the activity of glycerol-3-phosphate oxidase. (Author abstract by permission)

74-1907. Nelson, J. A. (Kettering-Meyer Lab., Southern Res. Inst., Birmingham, AL 35205). **Effects of dichlorodiphenyltrichloroethane (DDT) analogs and polychlorinated biphenyl (PCB) mixtures on 17β-(^{3}H)estradiol binding to rat uterine receptor.** *Biochem. Pharmacol. 23(2): 447-451; 1974.* (14 references)

DDT analogs or metabolites may produce estrogen-like effects via interaction with the estrogen receptor in vivo. Organochlorine inhibition of ^{3}H-estradiol binding to rat uterine receptors in vitro was investigated. Some of the DDT analogs, especially the *o,p'*-isomers, were effective inhibitors of estradiol binding: *o,p'*-DDT was the most effective inhibitor examined, with an order of activity about 1/2000 that of diethylstilbestrol. The other chlorinated hydrocarbons examined are less effective than *o,p'*-DDT by

orders of magnitude. Increases in uterine wet weight in immature rats 6 hr after i.p. administration of 50 mg/kg of compound were statistically significant for the compounds which produced greater than 30% inhibition of estradiol binding at the 100 ppm level. Carbon tetrachloride pretreatment of immature rats did not alter the amount of ^{3}H-estradiol bound to the uterine homogenate supernatant in vitro, nor did it alter the inhibitory effect of *o,p'*-DDT on the estradiol binding. Hydroxylation of chlorinated hydrocarbons to phenolic metabolites may be required for estrogenic activity. Therefore, the blockade of *o,p'*-DDT uterotropic activity after carbon tetrachloride administration could result from inhibition of hydroxylating enzymes. The interaction of *o,p'*-DDT with the estrogen receptor is competitive.

74-1908. George, K. C.; Eapen, J. (Biol. and Agr. Div., Bhabha Atomic Res. Cent., Bombay 400 085, India). **Mode of action of garlic oil—effect on oxidative phosphorylation in hepatic mitochondria of mice.** *Biochem. Pharmacol. 23(5): 931-936; 1974.* (18 references)

The effect of garlic oil on oxidative phosphorylation in liver mitochondria of mice has been studied. Garlic oil impairs oxidative phosphorylation in hepatic mitochondria. The coupling activity of sites 1, 2 and 3 appears to be affected by garlic oil. The extent to which respiration is affected varies with the substrates used. For example, garlic oil affects respiration during oxidation of NAD-linked substrates such as glutamate to a greater extent than during oxidation of succinate and ascorbate. The inhibitory effect on respiration is less than that on phosphorylation. Diallyl disulfide, the principal insecticidal component of garlic oil, has a similar inhibitory effect on the mitochondrial oxidative phosphorylation. In contrast, dipropyl disulfide, which is chemically comparable to diallyl disulfide but is devoid of insecticidal activity, has a substantially lesser effect on oxidative phosphorylation. (Author abstract by permission)

74-1909. Nenner, M. (Inst. fuer Pharmakol. und Toxikol., Goettingen Univ., Goettingen, Germany). **Phosphonylierte Aldoxime. Hemmwirkung auf Acetylcholinesterase und hydrolytischer Abbau. [Phosphonylated aldoximes. Inhibitory effect on acetylcholinesterase and hydrolytic degradation.]** *Biochem. Pharmacol. 23(8): 1255-1262; 1974.* (German)

The formation, acetylcholinesterase-inhibiting effect, and the hydrolytic degradation of phosphonylated aldoximes were studied. The first-order rate constants for the inhibition of acetylcholinesterase were determined for samples taken at definite intervals from a reaction mixture containing 0.0005 *M* oxime and 0.0000025 *M* soman. The investigation of 27 different aldoximes shows that a considerable part of the phosphonylated aldoximes has a higher inhibitory potency than soman, depending on the position of the oxime group and on the type of substituent fixed to the quaternary nitrogen atom in the aromatic ring. Pyridinium derivatives with an aldoxime group in second, third, or fourth position, and methylated at the nitrogen, have no stronger inhibitory effect after phosphonylation with soman than the original organophosphate. All pyridinium-4-aldoximes, bound across a bridge such as $-CH_2-CH_2-CH_2-$ or $-CH_2-O-CH_2-$ to a phenyl radical, a quaternary nitrogen, or another pyridinium ring yield (with soman) phosphonylation products with inhibitory effects stronger than that of soman. The rate constants of the acetylcholinesterase inhibition by the phosphonylation products of TMB-4 and toxogonin are over ten times higher than that of soman.

74-1910. Maayani, S.; Weinstein, H.; Ben-Zvi, N.; Cohen, S.; Sokolovsky, M.* (Dept. Biochem., George S. Wise Cent. for Life Sci., Tel-Aviv Univ., Tel-Aviv, Israel). **Psychotomimetics as anticholinergic agents. 1. Cyclohexylpiperidine derivatives: anticholinesterase activity and antagonistic activity to acetylcholine.** *Biochem. Pharmacol. 23(8): 1263-1281; 1974.* (52 references)

Phencyclidine (sernyl®, 1-[(1-phenylcyclohexyl)-piperidine]) and ten of its derivatives, known for their psychotomimetic activity, are potent competitive inhibitors of butyrylcholinesterase and acetylcholinesterase. The drugs also protect the enzyme against inactivation by an organophosphate (*sarin*), presumably by their direct interaction with the active site. In addition to the acetylcholine-like structural factors identifiable in these molecules, the cyclohexyl moiety is considered necessary for the interaction. The drugs are also competitive antagonists of acetylcholine in perfused organs (guinea-pig ileum, frog rectus abdominis) and in the eye of three mammals. This peripheral activity is three orders of magnitudes less potent than that of atropine. Antiacetylcholine activity in the central nervous system was studied through the antidotal effect of THA (tacrine), before and after injection of the drugs. The correlation between the anticholinesterase activity and the CNS activity as well as the structural relation of the drugs to agonists and antagonists of the cholinergic system is discussed. (Author abstract by permission)

74-1911. Nakagawa, M.; Uchiyama, M. (Inst. Pharm., Tohoku Univ., Aobayama Sendai, Japan). **Effect of organophosphate pesticides on lecithin–cholesterol acyltransferase in human plasma.** *Biochem. Pharmacol. 23(11): 1641-1645; 1974.* (15 references)

Organophosphates—dimethyldichlorovinylphosphate (dichlorvos), methyl parathion and sumithion (fenitrothion)-inhibited the esterification of cholesterol in sonicated dispersions of lecithin-cholesterol mixtures by the lecithin-cholesterol acyltransferase in human plasma. The order of inhibition by these compounds on the esterification was DDVP > methyl parathion >

sumithion. This difference in degree of inhibition by DDVP, methyl parathion and sumithion was not due to differences in enzymatic degradation of these compounds during incubation. The inhibitory effect of organophosphates on the acyltransferase was not eliminated by the addition of albumin, tri-serine, poly-serine and sulfhydryl protection agents. Poly-serine was a potent inhibitor of the acyltransferase. (Author abstract by permission)

74-1912. Godovikov, N. N.; Godyna, Ye. I.; Kabachnik, M. I.; Rozengart, V. I.; Rozengart, Ye. V.; Romanchuk, L. A.; Sitkevich, R. V.; Freydlin, T. S. (Inst. Hetero-Organic Compounds, Acad. Sci. USSR, Moscow, USSR). **O-Etil-S(omega-karbalkoksialkil) metiltiofosfonaty kak ingibitory kholinesterazy. [*O*-ethyl *S*-(omega-carbalkoxyalkyl) methylthiophosphonates as inhibitors of cholinesterase.]** *Biokhimiya 38(3): 616-620; 1973.* (12 references) (Russian)

The butyryl cholinesterase and acetyl cholinesterase inhibiting activity of *O*-ethyl *S*-(omega-carbalkoxyalkyl) methylthiophosphonates containing in the cleavable part an ester group located at various distances (one to four atoms) from the phosphorus atom was studied in vitro. An increase in this distance resulted in a decrease in the cholinesterase inhibiting efficiency which at distances of 3 and 4 atoms was at the same level as that of corresponding compounds without ester group in them. The inhibitory activity changed symbatically with the rate of hydrolysis at pH 7.8 and 100 C of the compounds at the phosphorus-sulfur linkage, which may be due to the inducing effect of the ester moiety. The decrease in the efficient concentration of the cholinesterase inhibitors during hydrolysis under the same conditions as assayed through the loss of inhibitory activity occurred far more readily than the destruction of the P-S linkage and may be due to the hydrolysis of the ester bond.

74-1913. Simon, M.; Berko, G.; Dobozy, A. (Clinics of Dermatology and Venereal Diseases, Szeged Med. Univ., Szeged, Hungary). **A sexual hormonok befolyasa a porphyrin anyagcserere modellkiserletben. [Influence of sex hormones on porphyrin metabolism in model experiments.]** *Borgyogy. Venerol. Szemle 49(2): 49-52; 1973.* (12 references) (Hungarian)

The effects of opposite sex hormones (estrone and testosterone) on porphyrinuria and lethality in BHC-poisoned 4-months-old male and female R. Amsterdam rats and in castrated male rats were studied in a 6-month-experiment. The animals were fed daily 0.2% BHC in the feed. The female rats were administered s.c. 2.5 mg testosterone twice a week, while the male rats were given daily 1 mg estrone acetate. The death rate after chronic BHC administration was significantly reduced. The BHC-induced porphyrinuria developed 5 weeks later in female rats treated with testosterone than in a control group fed BHC only, indicating the protective action of testosterone in female rats. In male rats treated with BHC and estrone the lethality was significantly higher, and porphyrinuria developed 5 weeks earlier than in a control group fed BHC only. The lethality-increasing and porphyrinuria-promoting effect of androgen deficiency was observed in castrated rats poisoned with BHC.

74-1914. Loracher, C.; Lux, H. D. (Max-Planck-Inst. Psychiatry, 8000 Munich 40, Germany). **Impaired hyperpolarising inhibition during insulin hypoglycaemia and fluoroacetate poisoning.** *Brain Res. 69(1): 164-169; 1974.* (14 references)

The effects of insulin hypoglycemia and fluoroacetate poisoning on the motoneuronal membrane potentials of anesthetized and decerebrated cats were studied. All of 15 motoneurones studied developed rising membrane depolarizations in the range of 2 to 8 mV, within 10 to 30 minutes after the i.v. infusion of Na-fluoroacetate (1 mg/kg). Five motoneurones spontaneously returned almost to the control resting membrane potential 35 to 45 minutes after infusion. The action potentials always showed comparable changes in amplitude. A depolarizing shift of the E-IPSP toward the resting membrane potential became obvious 60 to 110 min. after infusion. The loss of hyperpolarizing inhibition was almost complete within 2 hours in all cells. Intoxication for periods longer than 100 to 120 minutes elevated the stimulus threshold for all excitatory and inhibitory actions. Some time after the E-IPSP had shifted toward the resting membrane potential, a reduced dependency of IPSP amplitudes on the membrane potential was observed. Diminished inhibitory conductance is apparently important as a causative factor in the convulsive activity seen after fluoroacetate poisoning for the following reasons: changes in inhibitory as well as excitatory synaptic transmission appear considerably after the E-IPSP has shifted toward the resting membrane potential; and these potential reductions affect inhibitory and excitatory synaptic transmission to an equal extent.

74-1915. Styles, J. A. (Imperial Chem. Ind. Ltd., Ind. Hygiene Res. Labs., Alderley Pk., Cheshire, Great Britain). **Studies on the effects of paraquat and diquat on cells in culture. Viability of macrophages and fibroblasts incubated with paraquat and diquat.** *Brit. J. Exp. Pathol. 55(1): 71-77; 1974.* (17 references)

Rat peritoneal macrophages and alveolar macrophages and mouse fibroblasts were incubated in tissue culture with varying concentrations of diquat and paraquat. Irreversible damage to the macrophages occurred after 30 minutes of exposure to either pesticide at concentrations as low as 10^{-6} mol/l., resulting in the uptake of vital dye. Paraquat and diquat showed similar toxicity to both rat alveolar and peritoneal macrophages. Pesti-

cide concentrations of 10^{-5} mol/l. or less did not reduce the viability of the mouse fibroblasts as measured by dye exclusion although these concentrations did reduce cloning efficiency. The viability of the fibroblasts was reduced only by pesticide concentrations greater than those causing zero cloning efficiency. The toxicity of diquat to the fibroblasts was approximately 10-fold greater than that of paraquat. The proliferative reaction in the mammalian lung following the ingestion of paraquat could be due to a specific injury due to the presence of the pesticide or to a mitogenic effect on a certain cell type.

74-1916. Hamid, J.; Sayeed, A.; McFarlane, H. (Dept. Chem. Path. Med. Biochem., Med. Sch., Univ. Manchester, England). **The effect of 1-(*o*-chlorophenyl)-1-(*p*-chlorophenyl)-2,2-dichloroethane (*o,p'*-DDD) on the immune response in malnutrition.** *Brit. J. Exp. Pathol. 55(1): 94-100; 1974.* (18 references)

Young male Sprague-Dawley rats were maintained on normal or protein deficient diets, some of which included *o,p'*-DDD (TDE) (0.121 mg/g/day). The body, thymus, spleen, and adrenal weights were diminished in the *o,p'*-DDD treated rats. These animals also showed a minimal fatty infiltration of the liver. In the well nourished rats *o,p'*-DDD produced atrophy of the adrenal cortex and the thymolymphatic organs, but did not affect the kidneys, heart, or lungs. The number of plaque-forming cells (PFC) and rosette-forming cells (RFC) in the spleen and thymus of the pesticide treated animals was lower than in the controls. The pesticide treatment produced the greatest effect on the adrenal cortex of the malnourished rats; the plasma corticosteroid level was reduced and the immune response was impaired. The number of PFC and RFC in the spleen and thymus of the *o,p'*-DDD treated malnourished animals did not differ significantly from those in the malnourished controls. In general, the pesticide appeared to have a greater effect on PFC than on RFC. Compared with the controls, the thymocytes and spleen cells of the *o,p'*-DDD treated rats responded better to phytohemagglutinin than to pokeweed mitogen.

74-1917. Medley, J. G.; Bond, C. A.; Woodham, D. W. (USDA, APHIS, Plant Protection Quarantine Programs, Imported Fire Ant Lab., Gulfport, MS 39501). **The cumulation and disappearance of mirex residues. I. In tissues of roosters fed four concentrations of mirex in their feed.** *Bull. Environ. Contam. Toxicol. 11(3): 217-223; 1974.* (4 references)

Young leghorn roosters were maintained for up to 32 weeks on a diet containing 0, 0.007, 0.06, 0.71, or 7.21 ppm mirex. The birds remained healthy with only two dying of natural causes during the experiment. No relationship was found between mirex intake and obvious tissue differences in the birds. Residues of mirex in the breast tissues were low compared with other tissue samples; at least 26 weeks was required to exceed 2 ppm in breast tissue at the 7.21 ppm level of input. Mirex tended to accumulate in fatty tissue; at the 7.21 ppm feeding level the saturation level was reached in the fat after 26 weeks. The residues disappeared rapidly from the fatty tissues during the first 2 weeks after treatment ended. Good weight gainers retained higher levels of mirex longer. A good straight line relationship existed between the amount of mirex fed and the amount of residue accumulated. Twelve weeks after treatment had ceased, about half of the residues in the tissues had disappeared.

74-1918. Kohli, J. D.; Hasan, M. Z.; Gupta, B. N. (Ind. Toxicol. Res. Cent., Lucknow, India). **Dermal absorption of fenitrothion in rat.** *Bull. Environ. Contam. Toxicol. 11(3):285-290; 1974.* (10 references)

Fenitrothion (0.1 ml) was applied once, twice, or three times to the shaved backs of young adult ITRC rats. The pesticide was readily absorbed through the skin. Significant amounts were present in the blood two hours after dermal application. The blood levels increased with time, reaching maximum values after 8 hours and then decreasing. Increasing concentrations of fenitrothion in the plasma increased inhibition of cholinesterase activity. At a plasma fenitrothion concentration of 250 μg/ml cholinesterase activity was completely inhibited; the animals were moribund and showed tremors. Twenty four hours after dermal application 55 ± 4.5% of the compound remained unabsorbed. Repeated dermal application increased the fenitrothion concentration and the inhibition of cholinesterase activity in the blood. Thus, the possibility of dangerous effects increases with the degree and number of exposures to fenitrothion.

74-1919. Weber, R. P.; Coon, J. M.; Triolo, A. J. (Dept. Pharmacol., Thomas Jefferson Univ., Philadelphia, PA 19107). **Effect of the organophosphate insecticide parathion and its active metabolite paraoxon on the metabolism of benzo(a)pyrene in the rat.** *Cancer Res. 34(5): 947-952; 1974.* (22 references)

Male Sprague-Dawley rats were given daily i.p. injections of parathion (0.7 mg/kg) and its active metabolite paraoxon (0.3 mg/kg) over a period of 5 days, after which carbon-labeled benzo(a)pyrene (BP-^{14}C) was administered i.v. Parathion and paraoxon decreased the rate of excretion of the radioactive metabolites of BP-^{14}C through the bile without affecting the rate of bile flow. The pesticide treatment also increased the amount of unchanged BP-^{14}C and decreased the amount of BP-^{14}C metabolites in the liver and small intestine 95 minutes after BP-^{14}C administration; the concentrations of BP-^{14}C and its metabolites in the lung were unchanged. In vitro studies of the hydroxylation of BP showed a decreased activity of BP hydroxylase in the liver, small intestine, and lung of rats previously treated

with the organophosphate pesticides. BP hydroxylase activity was also inhibited when parathion or paraoxon was added directly to the incubation medium containing homogenates of liver, small intestine, and lung. Thus, both parathion and paraoxon inhibit the in vivo and in vitro metabolism of BP.

74-1920. Tu, C. M. (Res. Inst., Canada Dept. of Agr., London, Ontario, N6A 3KO Canada). **The temperature dependent effect of residual nematicides on the activities of soil microorganisms.** *Can. J. Microbiol. 19(7): 855-859; 1973.* (13 references)

The effects of Dasanit (fensulfothion), carbofuran, D-D, and Vorlex on microbial activities in a loamy sand were evaluated in laboratory experiments at temperatures of 5 and 28C. Bacterial and fungal populations initially decreased with some of the fumigant treatments but the populations recovered after 2 weeks. D-D and Vorlex significantly stimulated ammonification of soil native organic nitrogen at 28C after 4 weeks. In some instances, fumigants decreased ammonium production from added peptone at low temperature. No inhibition of nitrification and sulfur oxidation was evident with any of the nematicides. The effect of fumigant and glucose treatments on the respiration of microorganisms at 15 and 30C showed that the inhibition period observed in the early stages of incubation was negatively correlated with the soil temperature. (Author abstract by permission)

74-1921. Sethunathan, N.; Yoshida, T. (Int. Rice Res. Inst., Los Banos, Laguna, Philippines). **A *Flavobacterium* species that degrades diazinon and parathion.** *Can. J. Microbiol. 19(7): 873-875; 1973.* (12 references)

A *Flavobacterium* sp., isolated from paddy water by enrichment culture technique, decomposed diazinon in a mineral medium as sole carbon source. The bacterium readily hydrolyzed diazinon to 2-isopropyl-6-methyl-4-hydroxy-pyrimidine which was then converted to carbon dioxide. The bacterium also converted parathion to *p*-nitrophenol. The enzyme involved in the hydrolysis was constitutive. (Author abstract by permission)

74-1922. Flashinski, S. J.; Lichtenstein, E. P. (Dept. Entomol., Univ. Wisconsin, Madison, WI 53706). **Metabolism of Dyfonate by soil fungi.** *Can. J. Microbiol. 20(3): 399-411; 1974.* (18 references)

Thy metabolism and detoxication of ^{14}C-(ethoxy) and ^{14}C-(ring)-Dyfonate were demonstrated with isolated soil fungi. Quantitative and qualitative differences in the production of insecticide metabolites were observed. Among the nine fungal species tested, *Mucor plumbeus* and *Rhizopus arrhizus* were most active in degrading the insecticide, while *Penicillium notatum* was the least active. This activity was evidenced by the production of increasing amounts of water-soluble ^{14}C-compounds in the culture media and the disappearance (degradation) of the originally applied insecticide from the fungal cultures. The water-soluble metabolites were non-toxic to mosquito larvae. Hexane-extractable compounds from cultures of the most active species were non-toxic to fruit flies, while those from cultures of the less active fungal species were insecticidal. Among the metabolites produced and detected by thin-layer chromatography were primarily dyfoxon, ethylethoxyphosphonothioic acid, ethylethoxyphosphonic acid, methyl phenyl sulfoxide, and methyl phenyl sulfone. With *Aspergillus niger* and ^{14}C-(ring)-Dyfonate, most of the radiocarbon recovered from the TLC-plates was associated with an unknown compound. Production of the metabolites by the fungi was a function of the live mycelia, followed by excretion of water-soluble ^{14}C-compounds into the culture media. (Author abstract by permission)

74-1923. Focht, D. D.; Joseph, H. (Dept. Soil Sci. and Agr. Eng., Univ. California, Riverside, CA 92502). **Degradation of 1,1-diphenylethylene by mixed cultures.** *Can. J. Microbiol. 20(4): 631-635; 1974.* (13 references)

A nonaxenic sewage culture metabolized 1,1-diphenylethylene by two different pathways involving hydration to form 2,2-diphenylethanol and oxidation and fission of one of the benzene rings to form atropic acid. Five different bacterial strains which grew on 1,1-diphenylethylene were isolated; all were gram-negative rods comprising the genera *Pseudomonas, Acetomonas,* and *Acinetobacter.* A fungal isolate, *Cladosporium*, which used diphenylethylene as a sole carbon source, was also obtained from the same enrichment procedure. (Author abstract by permission)

74-1924. Smith, A. E.; Cullimore, D. R. (Res. Sta., Agr. Canada, Box 440, Regina, Saskatchewan, Canada). **The in vitro degradation of the herbicide bromoxynil.** *Can. J. Microbiol. 20(5): 773-776; 1974.* (3 references)

The in vitro degradation of the herbicide bromoxynil at the 25 ppm level by a flexibacterium, strain BR4, was investigated. The degradation was monitored using gas-chromatographic and spectrophotometric analytical procedures. Breakdown was rapid with only 5% of the original herbicide remaining after 5 weeks. No detectable degradation occurred in sterile medium. Thin-layer chromatographic techniques were used to isolate and identify 3,5-dibromo-4-hydroxybenzamide and 3,5-dibromo-4-hydroxybenzoic acid as degradation products. A third metabolite was isolated but not identified. (Author abstract by permission)

74-1925. Tu, C. M. (Res. Inst., Agr. Canada, London, Ontario N6A 3KO, Canada). **Effects of Mocap, N-Serve, Telone, and Vorlex at two temperatures on populations**

and activities of microorganisms in soil. *Can. J. Plant Sci. 53: 401-405; 1973.* (7 references)

The effects of Mocap (ethoprop), N-Serve, Telone (dichloropropene), and Vorlex on microbial activity in a sandy loam were determined at two temperatures. The pesticides did not suppress bacterial populations at 5 or 28 C. High levels of the fumigants, however, decreased fungal populations at 5 C after 2 wk. N-Serve and Telone stimulated ammonification of incorporated peptone, whereas an inhibitory effect occurred with Vorlex. Mocap and Telone at low levels stimulated nitrification of the native organic nitrogen after 2 wk at low temperature. All pesticides inhibited both nitrification of $(NH_4)_2SO_4$ and oxidation of elemental sulfur after 4 wk at 28 C. Oxygen consumption increased with increasing concentrations of Mocap. Treatment with fumigants and glucose depressed respiration in the early stages of incubation. The effects of the fumigants on respiration showed that soil temperature was negatively correlated with incubation time in the early stages of the experiments. (Author abstract by permission)

74-1926. Rosa, N.; Cheng, H. H. (Res. Station, Agr. Canada, Delhi, Ontario N4B 2W9, Canada). **Uptake of DDT by *Nicotiana tabacum*.** *Can. J. Plant Sci. 53(3): 443-446; 1973.* (12 references)

Nicotiana tabacum removed approximately 90% of the DDT from the growth medium over a range of 10 to 50 mg added/plant over a 2-wk period. Uptake from sand was similar up to 30 mg/plant, but uptake from soil averaged 32%. The rate of uptake from soil corresponded to that from growth medium in the range of 40 to 50 mg added/plant, suggesting that 30 mg was necessary to saturate binding sites on soil. The results indicate that tobacco has the ability to absorb DDT, and preliminary studies have shown that 90% of the DDT added to the medium can be recovered in the total plant tissue. The ability of tobacco to store DDT is in agreement with residue levels of 2-20 ppm DDT found in commercial tobacco products.

74-1927. Fournier, J. C.; Catroux, G. (Laboratoire de Microbiologie des Sols, Institut National de Recherches Agronomiques, Dijon, France). **Etude du metabolisme de la benzamide et de ses derives mono et dichlores par des souches d'*Aspergillus* sp. [Study of the metabolism of benzamide and its mono- and dichlorinated derivatives by cultures of *Aspergillus* spp.]** *C. R. Acad. Sci., Ser. D 275(15): 1723-1726; 1972.* (17 references) (French)

The metabolism of benzamide and its mono- and dichlorinated derivatives by cultures of *Aspergillus flavus, A. niger, A. fumigatus,* and *A. nidulans* was studied. Non-substituted benzamide proved to be a good source of nitrogen for all *Aspergillus* species although it was a source of nitrogen and carbon for *A. flavus* only. *A. flavus* utilized 3-chlorobenzamide, 4-chlorobenzamide, and 3,5-dichlorobenzamide as a source of nitrogen; 3-chlorobenzamide and 4-chlorobenzamide served as nitrogen sources for *A. fumigatus. A. niger* utilized 2-chlorobenzamide, 3-chlorobenzamide, and 2,5-dichlorobenzamide as a nitrogen source. *A. flavus* metabolized benzamide into protocatechuic acid, 4-chlorobenzamide into 4-chlorobenzoic acid, and 3,5-dichlorobenzamide into 3,5-dichlorobenzoic acid. *A. niger* metabolized 2-chlorobenzamide into 2-chlorobenzoic acid, and 2,5-dichlorobenzamide into 2,5-dichlorobenzoic acid. The 3-chlorobenzamide was metabolized into 4-hydroxy-3-chlorobenzoic acid by both *A. flavus* and *A. niger*, in the presence of other sources of carbon and nitrogen.

74-1928. Mostafa, I.; Moza, P.; Weisgerber, I.; Klein, W. (Inst. fuer Oekologische Chemie, Gesellschaft fuer Strahlen- und Umweltforschung mbH, Munich, Germany). **Beitraege zur Oekologischen Chemie LXX: Orientierende Versuche zum Lindan-Metabolismus hoeherer Pflanzen in Hydrokultur. [Contributions to ecological chemistry 70: Preliminary experiments on lindane metabolism of higher plants in hydroponic culture.]** *Chemosphere 3(2): 55-58; 1974.* (15 references) (German)

Hexane-soluble metabolites of lindane in *Phaseolus vulgaris* and *Zea mays* grown in lindane-treated hydroponic cultures for one week were studied by combined gas-liquid chromatographic and mass spectrometric method after cleanup by thin-layer chromatographic method. Hexane extracts from bean plants contained about 4 ppm gamma-pentachlorocyclohexane, about 0.36 ppm 1,2,4-trichlorobenzene, and about 20 ppm intact lindane. Corn plant extracts contained 5 ppm gamma-pentachlorocyclohexane; 0.30 ppm 1,2,4-trichlorobenzene and 0.14 ppm 1,2,3-trichlorobenzene. No trichlorobenzene and only traces of gamma-pentachlorocyclohexane were detected in tests without plants. Consequently, the trichlorobenzenes and the gamma-pentachlorocyclohexane identified in corn and bean plant samples are metabolites of lindane formed by dehydrochloration.

74-1929. Fournier, J. C. (Lab. de Microbiol. des Sols, Institut National de Recherches Agronomiques, Dijon, France). **Degradation microbienne de la 2,6-dichlorobenzamide dans des modeles de laboratoire. [Microbial degradation of 2,6-dichlorobenzamide in laboratory models.]** *Chemosphere 3(2): 77-82; 1974.* (6 references) (French)

The microbial degradation and metabolism of 2,6-dichlorobenzamide, 3,5-dichlorobenzamide, 2,5-dichlorobenzamide, and benzamide in clay and humus-rich soils was studied in percolation and incubation tests using ^{14}C-marked compounds. The rates of degradation diminished in the sequence benzamide, 3,5-dichlorobenzamide, 2,5-dichlorobenzamide, and

2,6-dichlorobenzamide. The metabolites detected were 2,6-dichlorobenzoic acid, 4-hydroxy-2,6-dichlorobenzamide, 3-hydroxy-2,6-dichlorobenzamide, 2-chlorobenzoic acid, and another unidentified compound. Accumulation of 2,6-dichlorobenzoic acid during biodegradation in the presence of 2,5-dichlorobenzamide was observed. A low rate of biodegradation of 2,6-dichlorobenzamide was determined.

74-1930. Lingens, F. (Inst. fuer Mikrobiol. und Molekularbiol., Univ. Hohenheim, Stuttgart, Germany). **Abbau von Herbiziden und Fungiziden durch Mikroorganismen des Bodens. [Degradation of herbicides and fungicides by soil microorganisms.]** *Chimia 27(12): 628-635; 1973.* (47 references) (German)

The degradation of herbicides and fungicides such as pyramines, phenoxy fatty acids, aromatic nitro compounds, *s*-triazines, urea derivatives, acid anilides, and benomyl by soil microorganisms is surveyed. Microbial degradation of pyramine (pyrazon) proceeds via 5-amino-4-chloro-2-(2,3-cis-dihydrocyclohexa-4,6-diene-1-yl)-3(2*H*)-pyridazinone, a pyrocatechol derivative, 2-(5-amino-4-chloro-3-oxo-2,3-dihydro-2-pyridazino)-cis,cis-muconic acid, 2-hydroxymuconic acid, and 5-amino-4-chloro-3(2*H*)pyridazinone to pyruvic acid and formaldehyde. Phenoxy fatty acids are first transformed into phenol and pyrocatechol derivatives for further decomposition. Degradation of 3,5-dinitro-*o*-cresol by *Arthrobacter simplex* and dealkylation and reduction of trifluralin by *Bacteroides ruminicola* ssp. *brevis* and *Lachnospira multiparus* were observed. The *s*-triazines are hydrolyzed and *N*-dealkylated by soil microorganisms. Linuron is metabolized most probably to 3,4-dichloroaniline, methoxymethylamine, and carbon dioxide. Slow degradation of carboxin, *o*-toluanilide, and 2,5-dimethyl-furane-3-carboxanilide by *Nocardia* species was observed. Benzimidazole derivatives induced mutations in *Salmonella typhimurium*, *Escherichia coli*, and *Fusarium oxysporum*.

74-1931. Anonymous. **Biologic determination and experimental study of abate.** *Chinese Med. J. 54(1): 12; 1971.*

The toxic effects and the residual effective duration of abate were studied on fish and warm-blooded animals. The LC50 and LC95 of abate for early fourth instar larvae of *Culex pipiens pallens Coquillett* were 0.0038 ppm and 0.0063 ppm, respectively; the LC50 for *Hypophthalmichthys molitrix* larvae was 23 ppm. The concentrations of abate needed to kill mosquito larvae were not lethal to fish, water fleas, tadpoles, or frogs. The oral LD50 for albino mice was 331.8 mg/kg. The preferential concentration for controlling mosquito larvae without harming their natural enemies and other aquatic animals is 0.5 ppm. Abate solution (1 ppm) stored for as long as 75 days was still able to kill mosquito larvae within 12 hours.

74-1932. Chin, B. H.; Eldridge, J. M.; Sullivan, L. J. (Chem. Hyg. Fellowship, Div. Sponsored Res., Carnegie-Mellon Univ., Pittsburgh, PA). **Metabolism of carbaryl by selected human tissues using an organ-maintenance technique.** *Clin. Toxicol. 7(1): 37-56; 1974.* (15 references)

Metabolic profiles of carbaryl in various human tissues were determined using a recently disclosed in vitro organ-maintenance technique. 1-Naphthyl-^{14}C or N-methyl-^{14}C carbaryl was applied to growth medium containing explants of the tissue. Each mixture was incubated for 18 hr and the medium analyzed by DEAE-cellulose column chromatography. Hepatic tissue performed the metabolic processes of demethylation and/or hydrolysis, hydroxylation, and oxidation, followed by conjugation. The kidney made naphthyl glucuronide, whereas the uterus, lung, and placenta produced naphthyl sulfate from carbaryl. The vaginal mucosa made glucuronide and sulfate conjugates and a slight amount of conjugating activity was found in uterine leiomyoma. Based on the anionic metabolites derived from each organ, their quantitative metabolic activity ranked in descending order is: liver, lung, kidney, placenta, vaginal mucosa, uterus, and uterine leiomyoma. The in vitro organ-maintenance technique [7] was disclosed recently as a potential method for the selection of a species metabolically similar to man for use in chronic toxicity studies without direct dosing of human subjects. The present study shows that this in vitro technique further aided in delineating the contributory role of each organ in metabolic processes. (Author abstract by permission.)

74-1933. Davy, F. B. (Texas A&M Univ., College Station, TX 77843). **The role of chemoreception in teleost locomotor behavior as affected by a pesticide.** *Diss. Abstr. Int. 34(7): 3104B; 1974.*

Changes in the locomotor behavior of goldfish (*Carassius auratus*) and bullhead catfish (*Ictalurus punctatus*) after exposure to DDT were examined. A highly significant time dependent correlation between consecutive turns in the locomotor pattern of normal goldfish, attributed to a "memory" process in the pertaining locomotor control mechanism in the central nervous system, is significantly reduced within four days by chronic exposure of the fish to 10 μg/l. *p,p'*-DDT. Keeping the fish in clean water during 130-139 days did not result in the restoration of the above correlation. When introduced into a novel environment normal goldfish display a highly specific, non-random exploratory behavior. It consists of a systematic spatial and temporal distribution of activity which in the light of its complexity is assumed to be under the control of the central nervous system. Aspects of this exploratory behavior are significantly affected by chronic exposure to DDT (10 μg/l. *p,p'*-DDT for four days) thus reinforcing earlier suggestions in the literature that the pesticide may affect functions controlled by the central nervous system. The

maintenance of the fish for 20 hours in laboratory water following exposure to DDT resulted in a decrease of the described DDT effect. In addition, there are suggestive trends for the effects of similar DDT exposure on the mechanism controlling the localization of a food source, particularly the locomotor variables: number of events, number of entries, distance travelled and number of turns on the bullhead. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-1004.)

74-1934. Bailey, R. L.(Univ. Georgia, Athens, GA 30604). **The effects of sublethal concentrations of DDT on schooling behavior.** *Diss. Abstr. Int. 34(7): 3288B; 1974.*

Juvenile white mullet (*Mugil curema*), juvenile channel catfish (*Ictalurus punctatus*) and adult golden shiners (*Notemigonus crysoleucas*) were exposed to sublethal levels of *p,p'*-DDT in water for 24 hrs and tested for their ability to school under decreasing light intensity. Light intensities ranged from 5.5 ft. candles to 0.012 ft. candles. Infrared photography and three mathematical indices were used to measure schooling behavior. Mullet and shiner schools dispersed at the lower light intensities. Catfish did not aggregate under high or low light levels. Exposure to 9 ppb DDT caused a significant reduction in schooling of mullet. Shiners exposed to 10 and 15 ppb DDT schooled less than those fish exposed to 1 and 5 ppb DDT. Low level exposures caused shiners and mullet to school better than control fish, possibly by acting as a stimulus. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 73-31,853.)

74-1935. Hudson, D. K. M. (Univ. Southern Mississippi, Hattiesburg, MS 39401). **Effects of mercury compounds on algae.** *Diss. Abstr. Int. 34(7): 3289B; 1974.*

Laboratory investigations were conducted to determine the effects of selected mercury compounds on eleven algal isolates representing three divisions. The mercurials tested included two inorganic and three organic compounds. Outside variables were controlled through use of a chemically defined medium, axenic cultures, and standardized conditions of lighting and temperature. Phenylmercuric acetate (PMA) was the most toxic mercurial tested, followed in decreasing order by phenylmercuric nitrate (PMN), mercuric chloride (MC), mercuric acetate (MA), and mercuric nitrate (MN). Death occurred within 25 days of exposure to these compounds at concentrations between 0.1 and 100.0 ppm. Cyanophycophyta were more sensitive than Chlorophycophyta to MC, MN, MA, and PMN, but were less sensitive to PMA. The Euglenophycophyta tested, *Euglena gracilis* "z," was the least sensitive to PMA, MC, and MA. Growth curves and morphology studies revealed that algae were often affected by concentrations as low as 0.000001 ppm of PMA or PMN. Six of the seven Chlorophycophyta tested exhibited pigmentation changes when exposed to mercury. No pigmentation changes were observed in any of the Cyanophycophyta or the Euglenophycophyta tested. Two of the Chlorophycophyta tested, *Ankistrodesmus* sp. and *Scenedesmus quadricauda*, exhibited increased percentages of cells with structural changes with increasing mercury concentration and length of time of exposure. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 73-32,005.)

74-1936. McDougal, H. D. (Univ. California, Davis, CA 95616). **Parathion induced alterations in acetylcholinesterase activity of rat brain: a biochemical, light and electron histochemical study.** *Diss. Abstr. Int. 34(7): 3336B-3337B; 1974.*

Following the administration of a sublethal dose of parathion to young albino rats, the response time of acetylcholinesterase (AChE) activity in the olfactory bulb (OB) and the nucleus caudatus putamen (NCP) was determined by biochemical assay. The AChE activity decreased within 15 minutes and reached a low in 1 hr in the OB and NCP. The initial rate of decline and recovery of AChE activity during the first 4 hours was comparable. After day 1 the AChE activity increased again until control values were equaled or surpassed by the 3rd day. The results imply that at least a fraction of AChE recovers rapidly prior to "aging" of the inhibited enzyme while another fraction recovers slowly or is completely resynthesized. AChE activity in the NCP under the light microscope was observed in large neurons whereas small neurons were essentially negative. At the fine structure level the reaction product of the large neuron was principally located on the membranes or in the cisternae of the granular endoplasmic reticulum (ER), the nuclear envelope, and the Golgi apparatus. The AChE activity of ER in the large neuron was little affected by parathion, whereas extracell activity was more severely inhibited and took longer to recover. A form of protection seems to be provided to the enzyme by the plasmalemma and a complex of internal membranes of the neuron. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-32,287.)

74-1937. Mazur, A. R. (Univ. Illinois at Urbana-Champaign, Urbana, IL 61801). **Effect of certain fungicides on soil nitrogen transformations and nitrogen form on growth of creeping bentgrass.** *Diss. Abstr. Int. 34(9): 4162B; 1974.*

Soil incubation studies were conducted to investigate the effect of benomyl, Dyrene, and maneb on the mineralization of N in soil. All three were shown to reduce nitrification rates when incorporated into soil. The degree of inhibition increased with increasing rates of fungicide. Maneb had the most pronounced effect on

nitrification. With 75 and 150 ppm maneb in soil, nitrification was totally inhibited for periods in excess of eight and sixteen weeks, respectively. Even at 25 ppm, maneb reduced nitrification for a period greater than eight weeks. Benomyl showed minimal effect by reducing nitrification for a period of less than four weeks even at the 150 ppm concentration. Dyrene had an intermediate effect and reduced nitrification for four weeks at 25 ppm and eight weeks at 75 and 150 ppm. These fungicides did not appear to inhibit the ammonification of soil organic matter. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 74-5636.)

74-1938. Talekar, N. S. (Univ. Wisconsin, Madison, WI 53706). **Environmental factors affecting the penetration, translation, and metabolism of some insecticides in pea plants.** *Diss. Abstr. Int. 34(9): 4427B-4428B; 1974.*

The importance of metabolic energy and nutritional factors on the penetration, translocation, and metabolism of insecticides in pea plants were investigated. It was found that the selective uptake of the organochlorine insecticide, lindane, into roots was related to energy supply systems of the root cells. To study the importance of plant nutrients on the penetration, translocation, and metabolism of an organophosphorus insecticide in plants, ^{14}C-(Ethoxy) Dyfonate was used. In roots, 81 to 91% of the recovered radiocarbon was associated with the organic solvent phase, while in the greens these phases contained only 10-16%. Conversely, only 8 to 11% of the total ^{14}C recovered from roots and 48 to 71% from greens was associated with the water phase. The amounts of unextractable radioactivity in the roots were relatively small (1 to 6% of the total recovered) while in the greens these figures were 19 to 47%. Nutrient deficiencies affected the production of water soluble metabolites and the amounts of unextractable radioactivity. Concentrations of Dyfonate in control roots amounted to 80.2 ppm and of Dyfoxon to 0.87 ppm. In the greens these concentrations were considerably lower, but the amounts of Dyfoxon in the greens relative to the amounts of Dyfonate were much larger. A lack of nitrogen or sulfur resulted in the presence of higher concentrations of Dyfonate in the roots, while deficiencies in potassium, calcium, or magnesium caused significant decreases in concentrations of both Dyfonate and Dyfoxon in roots. Concentrations of Dyfoxon in greens were reduced due to deficiencies of all elements, except nitrogen. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 73-23,090.)

74-1939. Miranda, C. L. (Virginia Polytechnic Inst. and State Univ., Blacksburg, VA 24061). **The effects of dietary protein quality, SKF 525-A and phenobarbital on hepatic drug metabolism and pesticide toxicity in the rat.** *Diss. Abstr. Int. 34(9): 4473B; 1974.*

Studies were conducted to assess the influence of dietary protein quality, SKF 525-A, and phenobarbital (PB) on drug metabolism in vivo and in vitro and on the toxicity of heptachlor epoxide. Feeding a gluten diet significantly reduced the in vivo metabolism of hexobarbital and the in vitro metabolism of ethylmorphine, aniline, and heptachlor. The reduction in metabolic rates is due to decreases in both microsomal protein and specific enzyme activity. Restriction of food intake results in increased aniline and heptachlor metabolism. Prior treatment with SKF 525-A inhibited the metabolism of all substrates examined. The magnitude of inhibition was less marked in animals fed gluten. PB treatment enhanced the metabolism of all substrates. The increases in microsomal protein and cytochrome P-450 in gluten-fed animals were insufficient to account for the increased metabolism. Although SKF 525-A inhibited heptachlor metabolism in all dietary groups, the acute toxicity of the pesticide was not reduced in SKF 525-A treated animals. Metabolism may not be the major mechanism by which dietary protein quality alters heptachlor toxicity. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-7081.)

74-1940. Smith, W. F., III. (Rutgers Univ., New Brunswick, NJ 08903). **Phytotoxicity and degradation of atrazine in selected zoysiagrass varieties.** *Diss. Abstr. Int. 34(10): 4774B; 1974.*

Studies on phytotoxicity and degradation of 2-chloro-4-(ethylamino)-6-(isopropylamino)-s-triazine (atrazine) in zoysiagrass (*Zoysia japonica* (Steud.)) were conducted to determine if differential degradation of the herbicide could explain differences in varietal tolerance. Foliar applications of 6 lb/A of atrazine completely killed sprigs of zoysiagrass, variety, 'Midwest,' but caused only slight reductions in vigor of sprigs of the variety, 'Meyer.' Degradation of ring labeled ^{14}C-atrazine to $^{14}CO_2$ was not detected for either variety after 48 hours. Degradation of atrazine in excised leaves of 'Midwest' and 'Meyer' was similar after 6, 24 and 48 hours. A polar compound, chromatographed identical to a suspected peptide conjugate obtained from excised leaves of GT 112 (atrazine-resistant) corn, was present as a metabolite in both varieties. Differential degradation of atrazine as observed between atrazine-susceptible and atrazine-resistant GT 112 corn was not observed between 'Meyer' and 'Midwest.' Uptake and distribution of the herbicide between tops and roots was found to differ between varieties at 48 hours. 'Midwest' contained more atrazine in tops at this time interval. The basis for differential tolerance of zoysiagrass varieties to atrazine does not appear to be readily explained by differential degradation of the herbicide, over the time intervals of 6, 24 or 48 hours. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-8821.)

74-1941. Wolf, D. C. (Univ. California, Riverside, CA 92502). **Degradation of bromacil, terbacil, 2,4-D, and atrazine in soil and pure culture and their effect on microbial activity.** *Diss. Abstr. Int. 34(10): 4783B-4784B; 1974.*

After a 600 day soil incubation under favorable moisture conditions 22% of the activity from 2.88 ppm 2-C^{14} bromacil was recovered as $C^{14}O_2$. The addition of 0.5% corn stalks or bean straw increased the value to 33%. Under the same conditions 27% of the activity added as 2-C^{14} terba il was recovered as $C^{14}O_2$ and the addition of the oranic amendment increased the value to 38%. Under favorable aerobic moisture conditions, degradation followed the first order rate law. No $C^{14}O_2$ was evolved from sterile soil. When the soil was saturated the evolution of $C^{14}O_2$ was less than 1% after 145 days for both bromacil and terbacil, but bromacil was rapidly converted to an unidentified metabolite. The presence of bromacil or terbacil in the soil did not affect the activity of the microbial population as measured by total CO_2 production. During a 550 day soil incubation period 18% of the activity of 2.5 ppm added ring-C^{14} atrazine wa evolved as $C^{14}O_2$. Greater than 87% of the activity from ring-C^{14} cyanuric acid was recovered as $C^{14}O_2$ after 16 days of incubation under favorable moisture conditions. Ring-C^{14} 2-chloro-4,6-diamino-*s*-triazine yielded 40% of th activity as $C^{14}O_2$ after 190 days. Atrazine did not affect the activity of the soil microbes as measured by total CO_2 evolution, numbers of microorganisms, kinds of fungi in the soil, or ability of soil-microbes to decompose bean straw. Atrazine was strongly adsorbed by fungal material and humic type polymers and laboratory synthesized model phenolic polymers. *Hendersonula toruloidea* in pure culture was shown to degrade 3% of 20 ppm added ring-C^{14} 2,4-D to $C^{14}O_2$. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-9259.)

74-1942. Eroschenko, V. P. (Univ. California, Davis, CA 95616). **The weight and histology of gonads, livers and adrenal glands in the Japanese quail as affected by photoperiods and the insecticide kepone.** *Diss. Abstr. Int. 34(10): 4792B-4793B; 1974.*

Immature Japanese quail of both sexes fed 200 ppm of the insecticide Kepone (chlordecone) when given 16 hours of light per day (16L:8D) had significantly enlarged reproductive organs, livers and adrenal glands. Reduction of light to 6L:18D resulted in very high mortality of both sexes, the effect on males being more severe than females. Kepone fed to young quail of both sexes kept under 6 hours of light (6L:18D) still produced enlarged oviduct (in females), livers and adrenal glands. No effect was seen on ovaries or testes. Administration of Kepone to older females while egg-laying did not affect the weight of reproductive organs or livers. In adult males, testes and livers were greatly enlarged. In both sexes adrenals were enlarged. Subsequent exposure of the Kepone fed adult quails of both sexes to reduced light produced no mortality. In Kepone fed males, testicular regression was recorded much earlier than in controls. After a reduction in the photoperiod, Kepone did not prevent the cessation of egg laying nor regression of the reproductive organs of the females. Kepone exerted its effects primarily on immature quail of both sexes and to a lesser degree on adult males. Histology of normal reproductive organs, livers and adrenal glands from immature and adult Japanese quail of both sexes was compared with that from quail fed 200 ppm insecticide Kepone under two different photoperiods. Kepone at this level enhanced cellular proliferation, cytodifferentiation and tubular gland formation in the oviduct of immature quail kept under either 16L:8D or 6L:18D light regimen whereas no obvious changes were noted in the oviducts from laying quail. Ovarian tissue from treated quail exhibited a higher frequency of primary oocytes and smaller follicles whereas liver cells from all treated birds contained large lipid-like inclusions. Hypertrophy of adrenal cortical and medullary cells was a common feature in all treated birds. The most apparent detrimental effect of Kepone was confined primarily to the testes of immature and adult quail under 16L:8D light regimen. Highly dilated seminiferous tubules, reduced germinal epithelium and spermatozoa, and abundant intraluminal cellular debris was a common occurrence. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 74-8504.)

74-1943. Sasaki, R. K. (Univ. Delaware, Newark, DE 19711). **Organophosphorus insecticides and the fertilization and early embryonic development of *Crassostrea virginica* Gmelin: an ultrastructural analysis.** *Diss. Abstr. Int. 34(10): 4840B-4841B; 1974.*

A series of experiments were performed to examine, with light and transmission electron microscopes, the fertilization and early embryonic development of the American oyster, *Crassostrea virginica*, and the effects of organophosphorus insecticides on these processes. Treatment of ova with parathion, malathion, or Abate prior to insemination had no significant effect on the fertilization process. Fertilization was slightly enhanced with exposure of ova to low concentrations of insecticides. Only at very high concentrations of insecticide was embryonic development inhibited. Of the insecticides tested, naled had the greatest inhibitory effect on fertilization and early embryonic development. The difference in the effects of these insecticides is thought to reflect the difference between direct and latent inhibitors. The interaction of the ova and the insecticide is thought to involve a non-specific mode of interaction. Two possible non-specific modes of interaction are discussed: indifferent narcosis and a non-specific phosphorylation of cytoplasmic components. The possible consequences of such interactions are discussed. (Author abstract by permission, abridged. Copies

of the thesis are available from University Microfilms, Order No. 74-8744.)

74-1944. Reischl, P. (Iowa State Univ., Iowa City, IA 52240). **Auditory detection behavior in parathion treated squirrel monkeys.** *Diss. Abstr. Int. 34(10): 5046B; 1974.*

Effects of the organophosphorus insecticide parathion on auditory detection behavior in squirrel monkeys (*Saimiri sciureus*) was investigated. Male squirrel monkeys were given parathion at 0 or 0.10 mg/kg for 148 days. Prior to dosage assignment, the monkeys were adapted to the laboratory and trained to bar-press in response to a 0.1 second tone for hearing threshold testing. Daily threshold testing employed the method of constant stimuli. Monkeys were required to reliably report hearing thresholds at 500, 1000, 2000, 4000, 8000, and 16000 Hz. Parathion exposure began after the 8 monkeys could be divided into 2 statistically matched groups based on stable baseline hearing threshold data. The parathion exposed group showed a significant ($p < 0.025$) increase in the standard deviation of hearing thresholds after 40 days of parathion exposure. The magnitude of the standard deviation continued to grow for 54 additional days and thereafter declined. Mean hearing thresholds between the control and exposed groups did not vary significantly according to the analysis of variance. It was concluded that daily oral doses of parathion at 0.10 mg/kg caused a decrement in the squirrel monkey's tone-reporting behavior during hearing threshold testing. The maximum safe level for daily human parathion intake as determined by the World Health Organization is 20 times smaller and is given as 0.005 mg parathion/kg. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-9150.)

74-1945. Lawley, P. D.; Shah, S. A.; Orr, D. J. (Chester Beatty Res. Inst., Inst. Cancer Res., Royal Cancer Hosp., London, Great Britain). **Methylation of nucleic acids by 2,2-dichlorovinyl dimethyl phosphate (dichlorvos, DDVP).** *Chem.-Biol. Interactions 8(3): 171-182; 1974.* (25 references)

The methylation of DNA and RNA by dichlorvos was studied using nucleic acids extracted from salmon sperm and *E. coli* and the human tumor cell line HeLa. Dichlorvos was a good methylating agent for DNA in vitro, with its methylating action resembling that of methyl methanesulfonate (MMS) rather than that of *N*-methyl-*N*-nitrosourea. In *E. coli* cells 3-methyladenine, the principal minor product in methylated DNA (other than 7-methylguanine) was not detected; this product was present when preisolated DNA was used. The overall extent of methylation achieved in the cells was small, but in *E. coli* cells, specific excision of the minor product was indicated. Dichlorvos appears to owe a high proportion of its cytotoxic properties to its ability to inhibit cell division by alkylation of the cellular constituents rather than the nucleic acids. Although dichlorvos appears to be a feeble mutagen, its lack of ability to induce mutations in mammalian systems may be ascribed to its rapid metabolic degradation to nonalkylating products. The assessment of the biological hazard presented by dichlorvos would appear to rest upon assessment of the extent to which it is able to methylate DNA in vivo.

74-1946. Novakova, S.; Dinoeva, S. (United Hyg. Health Res. Inst., Sofia, Bulgaria). **Biokemiai es hisztokemiai parameterek valtozasa kronikus Pathoran kezeles hatasara. [Alteration of the biochemical and histochemical parameters under the effect of chronic patoran treatment.]** *Egeszsegtudomany 17(3): 233-238; 1973.* (4 references) (Hungarian)

Histochemical, biochemical, and histomorphological changes occurring under the effect of chronic poisoning by patoran (metobromuron) were studied in albino rats in a 6-month-experiment. The LD50 of patoran was determined as 3,875 mg/kg in acute tests. The animals were fed daily 0.1 mg/kg, 2 mg/kg, 40 mg/kg, or 80 mg/kg patoran for 6 months. In the groups treated with 2 mg/kg, 40 mg/kg, and 80 mg/kg doses, temporary reduction of the cholinesterase activity, inhibition of the transaminase activity, initial activation of the acid and alkaline phosphatases, considerable reduction of the leucine aminopeptidase level, increased aldolase activity, temporary increase in the blood catalase activity, and reduced blood peroxidase activity were observed. The lactate and malate hydrogenase activities did not change. Peroxidase activity in the liver and spleen increased, cytochrome oxidase and catalase activity in the liver decreased, and cytochrome oxidase activity in the spleen decreased. The enzymatic changes are indicative of the inhibition of the tissue respiration, oxidation, and reduction processes. Increased blood carbamide level, reduced serum SH group level, and reduced vitamin C content in the adrenals were observed. Degeneration of the tubular parenchyma with hyaline casts in the lumen of the kidney, as well as hyperemia and lymphoid tissue degeneration in the spleen were determined.

74-1947. Suzuki, T.; Uchiyama, M. (Fac. of Pharmacy, Tohoku Univ., Sendai, Miyagi, Japan). **[On the reduction of nitro group in parathion by homogenate of spinach.]** *Eisei Kagaku (J. Hyg. Chem.) 20(2): 93-97; 1974.* (14 references) (Japanese)

Experimental studies were conducted on factors such as conditions, properties, and plant constituents which determine pesticide residues, especially of organophosphates. During these it was discovered that the homogenate of spinach could reduce the nitro group on parathion to the amino group. The conditions of the reaction and its properties were reported. The enzyme

system in spinach was strongly activated by the simultaneous addition of NADP, G-6-P (D-glucose-6-phosphate), and flavin-adenine dinucleotide; was only active in anaerobic condition; did not demand any metal in reducing nitro group; and was deactivated by heating. The enzyme activity of intact homogenate was fortified by the addition of the deactivated homogenate. This suggests the existence of some heat stable substance in the spinach tissue. The enzyme system in spinach may resemble to some extent the liver microsomal NADPH-linked-nitroreductase system in animals and be quite different from the nitroreductase system in bacteria. This was verified by experiments using living and dead (with destroyed membrane) bacterial cultures.

74-1948. Sram, R. J.; Zudova, Z. (Inst. Hygiene Epidemiol., Prague, Czechoslovakia). **The relationship of mutagenic activity and the chemical structure of alkylaminoaziridines in mice.** *Folia Biol. (Prague) 20(1): 1-13; 1974.* (18 references)

The methyl-, ethyl-, propyl-, isopropyl-, and butyl-derivatives of alkylamino-bis(1-aziridinyl) phosphine oxide were injected i.p. into male specific pathogen free ICR mice at a dose level of 0.5 or 1.0 mg/kg (KBW); the chemosterilants were dissolved in dimethyl sulfoxide (DMSO). In the second part of the experiment equimolar doses of these compounds (3.0 and 6.0 $\times$ 10^{-3} M/KBW) dissolved in DMSO or physiological saline were tested. The spectrum of changes induced by each compound was characteristic for the individual stages of spermatogenesis using the dominant lethal test. The maximum frequency of dominant lethals occurred in the second and sixth weeks with the 1.0 mg/KBW dose. With the exception of the methyl derivative the lower dose affected only the postmeiotic stage. The frequency of lethals decreased as the alkyl chain increased in the stage of late spermatids (second week). A similar relationship was noted between the chemical structure and the fertilizing capacity of the males in the stage of spermatogonia B (sixth week). The activities of the methyl- and isopropyl- derivatives were comparable, and there was no difference between the propyl- and isopropyl- derivatives. The frequencies of chromosome aberrations induced by the 6.0 $\times$ $10^{-3}M$/KBW were higher for the methyl-, ethyl-, and isopropyl- derivatives than for the propyl and butyl derivatives dissolved in DMSO and for the methyl derivative in physiological saline. The effectiveness of equimolar doses decreased in the following order: methyl > ethyl > propyl > butyl.

74-1949. Andryushchenko, V. V. (Inst. Biol. South Seas, Acad. Sci. Ukrainian SSR, Sevastopol, USSR). **O vliyanii DDT na dykhaniye i vyzhivayemost' Chernomorskikh krevetok. [The effect of DDT on the respiration and survival of Black Sea shrimp.]** *Gidrobiol. Zh. 8(5): 52-57; 1972.* (16 references) (Russian)

The accumulation of ^{14}C-labeled DDT and the effect of DDT on the oxygen consumption and the survival of Black Sea shrimp, *Leander adspersus* (Rathke), were studied in laboratory tests. ^{14}C-labeled DDT accumulated rapidly in the shrimp. The DDT concentration in the shrimp rose to over 100 times that in the water. The values found for the lowest LD100 in different seasons and at different water temperatures were 0.001 mg/liter, in June, at 17 C; 0.0001 mg/liter, in August, at 22 C; 0.1 mg/liter, in October and November, at 15-17 C; and 0.01 mg/liter, in November, at 17 C. In young shrimp, DDT concentrations of 0.001-0.01 mg/liter strongly reduced the oxygen consumption by the 15th day of the experiment after transitory increases and decreases; in adult shrimps the oxygen consumption, initially reduced, gradually normalized by the 10th day of the experiment, indicative of the increased susceptibility of young shrimp to DDT.

74-1950. Davydova, T. B. (Sverdlovsk Sci. Res. Inst. Maternity and Pediatrics, Ministry of Public Health of the Russian SSR, Sverdlovsk, USSR). **Vliyaniye tetrametiltiuramdisul'fida na estralnyy tsikl i detorodnuyu funktsiyu zhivotnykh pri ingalyatsionnom vozdeystvii. [Effects of thiram on estrous cycle and reproductive function of animals after inhalation exposure.]** *Gig. Sanit. 38(4): 108-110; 1973.* (3 references) (Russian)

The effect of 3.8 and 0.45 mg/m^3 concentrations of thiram was studied on the estrous cycle and the reproductive function of sexually mature female rats. The animals inhaled thiram for 6 hours a day, 5 days a week, for 4.5 months. During the initial period of the experiment, the estrous cycle was prolonged. The reproductive function was disturbed (reduced rate of conception, reduced fertility, and underdevelopment of the embryos) despite normalization of the estrous cycle by the end of the experiment. The changes in the estrous cycle and in the reproductive function occurred against the background of the general toxicity of thiram.

74-1951. Strusevich, Ye. A.; Ekshtat, B. Ya. (Novosibirsk Sci. Res. Inst. Sanit., Novosibirsk, USSR). **Vliyaniye nekotorykh khlorirovannykh uglevodorodov na ekzokrinnuyu funktsiyu podzheludochnoy zhelezy. [Effects of some organochlorine pesticides on the exocrine function of the pancreas.]** *Gig. Sanit. 39(1): 94-96; 1974.* (4 references) (Russian)

The effects of D-D, DDB, 1,3-D, and 1,3-dichloropropene on the trypsin, trypsin inhibitor, amylase, and lipase activities in the blood serum of albino rats poisoned orally with these preparations for 6 months were studied. The animals were fed daily 3, 0.6, and 0.1 mg/kg doses of DDT; 6, 1.2, and 0.25 mg/kg doses of DDB; 2.5, 0.5, and 0.1 mg/kg doses of 1,3-dichloropropene; and 3, 0.6, and 0.1 mg/kg doses of 1,3-D, respectively. Increased trypsin activity during the entire duration of the experiment and reduced trypsin inhibitor activity starting from the second month of the

experiment were observed. The blood lipase activity permanently increased, and amylase activity tended to be reduced. The increase in the trypsin activity may be due to the increased permeability of the cell membranes in the pancreas and to the intensified synthesis of inhibitory proteins; the increased lipase activity in the blood may be attributed to both the increased cell membrane permeability and the increased trypsinogen activity with simultaneous deficiency of inhibitory proteins under the action of the organochlorine pesticides studied.

74-1952. Dinerman, A. A.; Rozhdestvenskaya, N. A. (A. N. Sysin Inst. General and Communal Hyg., Acad. Med. Sci. USSR, Moscow, USSR). **Eksperimental'noye izucheniye otdalennykh posledeystviy migratsii pestitsidov. [An experimental study of remote consequences of the migration of pesticides.]** *Gig. Sanit. 39(2): 22-26; 1974.* (5 references) (Russian)

The embryotoxic and teratogenic effects of DDT were studied in mice and chickens. Female rats were administered single 170 mg/kg doses of DDT on days 1, 4, 9, and 13 of pregnancy. Extensive hemorrhages and necrosis, absence of glycogen and RNA were observed in the placenta, especially in rats given DDT on days 9 and 10 of pregnancy. The DDT residue levels decreased most in the liver, then brain, placenta, fetal liver, fetal brain, blood, and amniotic fluid. The DDE residue levels decreased in the succession liver, fetal liver, placenta, brain, fetal brain, blood, and amniotic fluid; DDD levels decreased in the order liver, fetal liver, and placenta. No DDE was detected in the fetal brain or in the maternal blood. The findings indicate the passage of high doses of DDT through the placental barrier. Increased embryonal, preimplantational and postimplantational lethality; underdevelopment of the embryos; anomalies in the form of subcutaneous hemorrhages; reduced liver weight; and reduced glycogen, DNA, and nucleic acid levels in the liver of the embryos were observed. In another experiment with pregnant rats 0.5 mg/kg of DDT daily for 20 days reduced fertility, underdevelopment of the embryos, subcutaneous hemorrhages, and reduction of the amino acid and nucleic acid levels in the embryos were detected.

74-1953. Fedorova, L. M.; Belova, R. S. (Saratov Sci. Res. Inst. Rural Hyg., Saratov, USSR). **Vklyucheniye 2,4-D fenoksiuksusnoy kisloty v organy zhivotnykh, puti i dinamika yeye vydeleniya. [Incorporation of 2,4-D in animal organs, routes and dynamics of excretion.]** *Gig. Sanit. 39(2): 105-107; 1974.* (Russian)

The incorporation in the organs; the routes and dynamics of excretion in urine, feces, and milk; the metabolism; and the transplacental passage of 2,4-D were studied in male and female rats following oral administration of a single 0.05 mg/kg dose of ^{14}C-labeled 2,4-D and of a single 100 mg/kg non-labeled dose. During the first day after administration 2,4-D was detected in the blood, adipose tissues, kidneys, liver, spleen, and brain and also in the heart and sex organs of females. The percentages of 2,4-D found in the gastrointestinal tract 1 hr and 26 hr after administration were 27.5-37% and 0.6-1.4%, respectively. The excretion in urine and feces takes about 30 days with 50% eliminated in 24 to 48 hr. The elimination in milk lasts over 7 days with the highest rate of elimination on the second and third days. Some 1% of the total intake passes daily to the offspring: the rate of transplacental passage was 16.8%. The distribution of 2,4-D in the uterus, fetus, and amniotic fluid was largely uniform. Metabolism of 2,4-D into 2,4-dichlorophenol in the urine, feces, and milk was not observed.

74-1954. Litvinov, N. N. (A. N. Sysin Inst. General and Communal Hyg., USSR Acad. Med. Sci., Moscow, USSR). **Vliyaniye alkilsul'fata natriya na toksikodinamiku anilina i khlorofosa pri dlitel'nom sovmestnom peroral'nom postuplenii v organizm podopytnykh zhivotnykh. [The effect of sodium alkylsulfate on the toxicodynamics of aniline and trichlorfon in their joint introduction per os to experimental animals for a long period of time.]** *Gig. Sanit. 39(3): 11-15; 1974.* (4 references) (Russian)

The effects of 0.5 mg/liter (maximum allowable concentration in water), 5 mg/liter, and 0.1 mg/liter concentrations of sodium alkylsulfate on the toxicodynamics of orally administered 500 and 1,500 mg/liter doses of aniline and 500 and 1,000 mg/liter doses of trichlorfon in water were studied. Sodium alkylsulfate had no effect on the toxicity of jointly administered aniline and trichlorfon in terms of methemoglobinemia and cholinesterase activity when administered in concentrations of 0.1 and 0.5 mg/liter. However, when aniline and trichlorfon were administered against a background of 5 mg/liter sodium alkylsulfate, the latter potentiated the toxic effects of aniline and trichlorfon during the first 1.5 months of poisoning, after which it antagonized both. By the end of the 7-month-experiment, sodium alkylsulfate again potentiated the effects of aniline and trichlorfon; i.e., caused excessive reduction of the cholinesterase activity and excessive increase of the methemoglobin level.

74-1955. Kagan, Yu. S.; Trakhtenberg, I. M.; Rodionov, G. A.; Lukaneva, A. M.; Voronina, L. Ya.; Verich, G. Ye. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Vliyaniye pestitsidov na vozniknoveniye i razvitiye nekotorykh patologicheskikh protsessov. [Effect of pesticides on the onset and development of certain pathological processes.]** *Gig. Sanit. 39(3): 23-27; 1974.* (Russian)

The effects of daily 1/20 to 1/ 000 LD50 doses of DDT, aldrin, lindane, trichlorfon, ethylmercury chloride, phenylmercury acetate, and carbaryl on the onset and development of pathological processes such as pituitrin-induced coronary deficiency, adrenalin-caffein-induced

myocarditis, cholesterol-induced atherosclerosis, and carbon tetrachloride-induced liver lesions were studied in rabbits and rats in a chronic experiment for up to 9 months. DDT aggravated the coronary deficiency and myocarditis; DDT and carbaryl aggravated the atherosclerotic process, and the joint action of carbon tetrachloride and ttrichlorfon increased the serum alanine aminotransferase activity and the serum sorbitol dehydrogenase level.

74-1956. Dinoyeva, S. K. (Academy of Medicine, Sofia, Bulgaria). **Dinamika izmeneniy immunnoy struktury limfaticheskikh follikulov selezenki pri intoksikatsii pestitsidami. [Dynamics of the changes in immunological structures of lymphatic follicles in spleen during pesticide poisoning.]** *Gig. Sanit. 39(3): 85-87; 1974.* (6 references) (Russian)

Changes in the immunological structures of the spleen were studied in 30-35-day-old albino rats poisoned with daily 12,5 and 125 mg/kg doses of zineb, 1.5 mg/kg of carbaryl, 5 mg/kg of tribufon, and 8 mg/kg of afalon (linuron) for 6 months. One of the control groups received daily 2 mg/kg doses of cyclophosphamide. Plethora of the spleen and retardation of the development of the lymphatic follicles were observed in the groups treated with carbaryl, afalon, and large doses of zineb. The changes were similar to those produced by cyclophosphamide. The changes in the lymphatic follicles were negligible in the groups treated with small doses of zineb and with tribufon. The cytostatic effect of zineb affected primarily the T lymphocytes, while the B lymphocytes were rather resistant. In contrast to the cyclophosphamide-treated group the pesticide-treated groups showed few changes in the structure and weight of the thymus.

74-1957. Grigor'eva, L. V.; Korchak, G. I.; Kudzina, G. D. (Kiev A. N. Marzeyev Sci. Res. Inst. General and Communal Hyg., Kiev, USSR). **Opredeleniye toksicheskogo deystviya khlororganicheskikh soyedineniy metodom kul'tur kletok. [Determination of the toxic effect of organochlorine compounds by the cell culture method.]** *Gig. Sanit. 39(4): 93-95; 1974.* (4 references) (Russian)

The toxic effects of 2,3,6-trichlorobenzoic acid (2,3,6-TBA), dicamba, trichlorotoluene, pentanate, hexanate, chloramp, and acrofol on cell cultures of human embryonic fibroblasts, monkey kidney, NEr-2, KV, and A-1 were studied for the determination of the threshold and of the highest ineffective doses. The results obtained were compared with those from chronic poisoning tests in albino rats. The cell degeneration always appeared on the first day and was aggravated during the subsequent 2 to 3 days. The generative changes (coherency loss of the cytoplasm, granulation of the protoplasm, rounding of the cells, reduced cell size and light reflex) were unspecific and independent of the nature of the compounds. Primary cell cultures of human embryonic and monkey kidney cells were most susceptible, and NE2-2 cultures were least sensitive to the organochlorine compounds. A fairly good correlation was established between the highest ineffective doses, especially the threshold doses as determined in NEr-2 cultures, and the corresponding doses determined in chronically poisoned rats.

74-1958. Merenyuk, G. V.; Timchenko, L. A. (Moldavian Sci. Res. Inst. Hyg. Epidemiol., Kishinev, USSR). **Vliyaniye dinitroortokrezola na pochvennuyu mikrofloru. [Effects of DNOC on soil microflora.]** *Gig. Sanit. 38(4): 111-112; 1973.* (1 reference) (Russian)

The effects of different concentrations of DNOC were studied on soil microflora and extraneous pathogenic bacteria such as *Escherichia coli* and *Salmonella typhimurium*. When present in the soil in low concentrations of 3 mg/kg and over, DNOC may exert unfavorable effect on the soil microflora. DNOC strongly inhibits the nitrifying and cellulolytic bacteria and also the pathogenic microflora when present in concentrations from 30-300 mg/kg. In soils containing 30 mg/kg and 300 mg/kg DNOC, *S. typhimurium* was present for two months and for one month, respectively, against six months in the control. *E. coli* was present not longer than 1.5 months in soils containing 300 mg/kg DNOC.

74-1959. Yefimenko, L. P. (Inst. Rural Hyg., USSR). **Materialy k otsenke gonadotropnogo i mutagennogo deystviya gerbitsida butilovogo efira 2,4,5-T. [Data for assessing gonadotropic and mutagenic action of the herbicide 2,4,5-T butyl ester.]** *Gig. Tr. Prof. Zabol. 4: 24-27; 1974.* (13 references) (Russian)

The general toxic, gonadotropic, and mutagenic action of 2,4,5-T butyl ester was studied in male rats administered single 1, 0.1, 0.01, or 0.001 mg/kg doses of 2,4,5-T butyl ester, or daily 0.1 and 0.01 mg/kg doses for seven months through gastric tube. Single doses did not cause general toxic effects, changes in the functional status of the spermatozoids or in the mitotic activity of the bone marrow cells, but did produce chromosome damage in the form of chromatid type aberrations or chromosome adhesion. The smallest dose of 0.001 mg/kg had no mutagenic effect. Changes in the functions of the central nervous system, kidney, and in the composition of the peripheral blood, as well as reduction in the size and weight of the testicles, of the spermatogenesis index, and appearance of giant cells in the germinal epithelium were observed in chronic experiments with 0.1 mg/kg doses. The threshold of the general toxic and gonadotropic action was 0.1 mg/kg in the chronic experiment. Cytogenetic activity was apparent at the level of the no-effect dose of 0.01 mg/kg.

74-1960. Langenbeck, U.; Geldmacher-von Mallinckrodt, M. (Inst. fuer Humangenetik, Univ. Goettingen, Germany). **Diskussionsbemerkung zur Arbeit "Genetisch determinierter Polymorphismus der menschlichen Serum-Paraoxonase (EC 3.1.1.2)". [Letter: Comments in response to "Genetically Determined Polymorphism of Human Serum Paraoxonase (EC 3.1.1.2)".]** *Humangenetik 19: 353-356; 1973.* (12 references) (German)

Comments to the referenced article (See abstract No. 73-1710) and the author's reply are presented. The human serum paraoxonase activity was determined by two different methods during a study of the genetically determined polymorphism of human serum paraoxonase. The paraoxonase activity was determined spectrophotometrically. One method measured the *p*-nitrophenol cleaved from paraoxon at pH 11.2 according to Krisch's method; another used an anticholinesterase technique in which the paraoxonase activity was determined from the residual serum cholinesterase activity following incubation with paraoxon without physostigmine. Trimodal distribution of the serum paraoxonase activity was determined from investigations of blood samples from 190 subjects. A correlation with a factor of +0.82 was found between the residual serum cholinesterase activity following paraoxon incubation in vitro and the serum paraoxonase activity.

74-1961. Nagy, S.; Straus, H.; Ghelberg, N. W.; Salagean, S. (Institutul de Sanatate Publica si Cercetari Medicale, Cluj, Rumania). **Cercetari experimentale privind efectele toxice ale malationului pe organisme iradiate. [Toxic effects of malathion on irradiated organisms.]** *Igiena 21(7): 409-14; 1972.* (5 references) (Rumanian)

Studies were done on the long-term effects of different insecticides, including diluted malathion solutions, on some aquatic organisms (frog eggs and tadpoles of *Rana* species). Some were previously exposed to ionizing radiation (100 rad). The experiments were done in parallel on irradiated and nonirradiated organisms. The irradiated organisms showed increased sensitivity to malathion. Adaptation of the organisms to the insecticide dilutions used decreased the effect of irradiation. A threshold concentration was found for the insecticide in water. Low concentrations of insecticide in water (0.2 ppm) have a stimulating effect on the organisms' resistance and development; higher (0.7 ppm) concentrations tended to potentiate the toxicity of the insecticides. Irradiation of the organisms accentuates the above effects.

74-1962. Konar, S. K. (Kalyani, India). **Toxicity of nicotine to aquatic life.** *Indian Sci. Congr. Ass. Proc. 59(3): 458; 1972.*

The toxicity of nicotine to 10 species of fish, eight species of aquatic insects, and 11 species of plankton was determined. The lethal concentrations of nicotine varied according to species, the insects being several times more tolerant to the drug than the fish. Turbidity had no effect on nicotine toxicity, while increasing pH and the addition of commercial soda and lime increased nicotine toxicity. The cladocerans and copepods were more susceptible than the phytoplankters to nicotine toxicity. The nicotine lost its residual toxicity in alkaline waters within 8 days. Nicotine in combination with DDVP (dichlorvos) completely controlled both fishes and insects. The liver and kidney tissues of the exposed fish were severely damaged by the nicotine. Thus, nicotine appears to be safer and more efficacious than rotenone, endrin, and some organophosphorus and organochlorine insecticides which are currently being used in fishery management.

74-1963. Cserjesi, A. J. (Dept. Environ., Canadian Forestry Serv., Western Forest Products Lab., Vancouver, British Columbia, Canada). **Detoxification of chlorinated phenols.** *Int. Biodeterior. Bull. 8(4): 135-138; 1972.* (35 references)

The main process for the detoxification of chlorinated phenols by microorganisms is the formation of methylated products. Chlorinated monohydroxyphenols are methylated to the corresponding anisoles, and the tetrachlorodihydroxyphenols, metabolites of PCP, are also at least partially methylated. The dihydroxyphenols are intermediates in the degradation of benzene and its derivatives by microorganisms; thus, there is a strong possibility that the tetrachlorodihydroxyphenols are also intermediates in the biological degradation of PCP. The fate of these metabolites in the environment is uncertain. The toxicity of the chlorinated phenols is lowered by methylation, so their use as pesticides may be affected if the protected material supports the growth of the microorganisms which are able to methylate the phenols. In addition, the pH of the protected material (if higher than about 6) has an adverse effect on the toxicity of the chlorinated phenols. This decrease in toxicity may explain the failure of the chlorinated phenols to protect materials with pH higher than 6.

74-1964. Dinamarca, M. L.; Ramirez, A.; Villar, E. Del; Capdevila, J. (Dept. Chem. Biochem., Sch. Med., Univ. Chile, Santiago, Chile). **DDT-dehydrochlorinase. III. Enzymic oxidation of glutathione.** *Int. J. Biochem. 5(1): 1-9; 1974.* (18 references)

Highly purified DDT-dehydrochlorinase (DDT-ase) from adult DDT-resistant houseflies was able to act as a glutathione oxidase. Both the monomeric and tetrameric forms of the enzyme showed oxidation activity, which was lost by titration of the enzyme's 32 sulfhydryl groups with PCMB. There was a linear relationship between activity and enzyme concentration. The optimal pH for GSH was between 7.0 and 7.4, the optimum temperature being 30°C. The oxidation

activity of the enzyme was unaffected by the addition of various metals and cofactors. The oxidation-reduction reaction did not involve the liberation of protons. No oxidation was detected using β-mercaptoethanol, DDT, cysteine, or thiolhistidine as substrates. Only glutathione and thioglycolic acid acted as substrates, the initial rate of oxidation of the latter being approximately three times that of GSH. It is possible that the unsaturated fatty acids in the DDT-ase play an important role in the oxidation of GSH.

74-1965. Gill, S. S.; Hammock, B. D.; Casida, J. E.* (Div. of Entomol. and Parasitol., Univ. of California, Berkeley, CA 94720). **Mammalian metabolism and environmental degradation of the juvenoid 1-(4′-ethylphenoxy)-3,7-dimethyl-6,7-epoxy-*trans*-2-octene and related compounds.** *J. Agr. Food Chem. 22(3): 386-395; 1974.* (23 references)

Radiolabeled preparations of 1-(4′-ethylphenoxy)-3,7-dimethyl-6,7-epoxy-*trans*-2-octene (ethyl epoxide), its diene precursor (ethyldiene), and its 6,7-diol (ethyldiol) and 2,3-6,7-diepoxide (ethyl diepoxide) derivatives were subjected to degradation in various biological and photochemical systems. Major identified products formed from the ethyl epoxide are: the ethyldiol and α-hydroxyethyldiol on incubation with mouse, rat, or rabbit liver microsome-NADPH systems and algae; compounds resulting from ether cleavage in living mice; the ethyldiol, ethyl diepoxide, and ethylphenol on exposure to sunlight as residual deposits or in aqueous solution. Comparable studies with the ethyldiene, ethyldiol, and ethyl diepoxide led to tentative identification by cochromatography and sometimes by derivatization techniques of over 25 metabolites and photoproducts. The ethyl epoxide is transformed at varying rates in the systems examined by epoxide hydration, 2,3-epoxidation, α and β oxidation of the ethyl group, and ether cleavage. (Author abstract reprinted by permission of the American Chemical Society)

74-1966. Phillips, J. B.; Wells, M. R.* (Dept. of Biol., Middle Tennessee State Univ., Murfreesboro, TN 37130). **Adenosine triphosphatase activity in liver, intestinal mucosa, cloacal bladder, and kidney tissue of five turtle species following in vitro treatment with 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane (DDT).** *J. Agr. Food Chem. 22(3): 404-407; 1974.* (11 references)

Liver, intestinal mucosa, cloacal bladder, and kidney tissue were removed from five turtle species and assayed for adenosine triphosphatase (ATPase) activity following treatment with various concentrations of DDT for 30 min. These data indicate that the total (Na^+,K^+,Mg^{2+})-, Mg^{2+}-, and (Na^+,K^+)-dependent ATPases in the tissues of the five turtle species studied were significantly inhibited by 53 μM DDT. Treatment with 5.3 μM DDT caused some inhibition and stimulation. These results suggest that active transport may be severely affected by the action of DDT upon these ATPase systems. (Author abstract reprinted by permission of the American Chemical Society)

74-1967. Rosenkranz, H. S.; Wlodkowski, T. J. (Dept. Microbiol., Coll. Physicians and Surgeons, Columbia Univ., New York, NY 10032). **Mutagenicity of ethylene chlorohydrin. A degradation product present in foodstuffs exposed to ethylene oxide.** *J. Agr. Food Chem. 22(3): 407-409; 1974.* (12 references)

Ethylene chlorohydrin (2-chloroethanol) is mutagenic for *Salmonella typhimurium* in which microorganism it induces mutations of the base-substitution type. This chemical also preferentially inhibits the growth of DNA polymerase deficient bacteria which is taken to indicate an ability to react with the DNA of living cells. In view of the possible presence of ethylene chlorohydrin in foodstuffs exposed to ethylene oxide, the potential hazard of human exposure to this chemical requires examination. (Author abstract reprinted by permission of the American Chemical Society)

74-1968. Gardiner, J. A.; Kirkland, J. J.; Klopping, H. L.; Sherman, H. (Biochemicals Dept., Haskell Lab. for Toxicol. and Ind. Med., E. I. du Pont de Nemours & Co., Wilmington, DE 19898). **Fate of benomyl in animals.** *J. Agr. Food Chem. 22(3): 419-427; 1974.* (15 references)

A rat and a dog eliminated >99% of single, oral doses of [2-^{14}C]benomyl [methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate] via the urine and feces within 72 hr. The major metabolite was methyl 5-hydroxy-2-benzimidazolecarbamate (5-HBC), which is present in the urine as glucuronide and/or sulfate conjugates. Based on residue analyses, dairy cows and chickens display the same route of metabolism and elimination. Other possible degradation products in animal systems include methyl 2-benzimidazolecarbamate (MBC) and methyl 4-hydroxy-2-benzimidazolecarbamate (4-HBC). Residue data from all studies, including 2-year chronic feeding tests with dogs and rats, demonstrate that benomyl and its metabolites do not accumulate in animal tissues. Milk from dairy cows and eggs from chickens contain detectable residues (0.1 ppm or less) only at high dietary levels of benomyl (25-50 ppm). Synthesis methods for all three breakdown products and for [2-^{14}C]benomyl are described. (Author abstract reprinted by permission of the American Chemical Society)

74-1969. Yu, C. C.; Booth, G. M.*; Hansen, D. J.; Larsen, J. R. (Dept. of Zool., Brigham Young Univ., Provo, UT 84601). **Fate of carbofuran in a model ecosystem.** *J. Agr. Food Chem. 22(3): 431-434; 1974.* (11 references)

Ring-^{14}C- and carbonyl-^{14}C-labeled carbofuran (2,2-dimethyl-2,3-dihydrobenzofuranyl 7-*N*-methylcar-

bamate) were studied in a model ecosystem similar to that devised by Robert L. Metcalf and coworkers. Carbofuran was rapidly degraded in water. Carbofuranphenol, carbofuran, 3-ketocarbofuran, 3-hydroxycarbofuranphenol, *N*-hydroxymethylcarbofuran, and 3-hydroxycarbofuran and several other unknown spots were detected by thin-layer chromatography and autoradiography in ether extracts from water. Radioactivity in a NaOH trap rose steadily, accompanied by rapid loss of radioactivity in the water treated with carbonyl-^{14}C-labeled carbofuran. No parent carbofuran was found in living organisms. However, large amounts of the parent carbofuran were found in dead crabs which died soon after application of the pesticides. Carbofuran was highly toxic to crabs, clams, *Daphnia*, and snails immediately after application to the model ecosystem, but all animals except one crab survived restocking 20 days later. (Author abstract reprinted by permission of the American Chemical Society)

74-1970. Steller, W. A.; Brand, W. W. (Agr. Div., American Cyanamid Co., Princeton, NJ 08540). **Analysis of dimethoate-treated grapes for the *N*-hydroxymethyl and de-*N*-methyl metabolites and for their sugar adducts.** *J. Agr. Food Chem. 22(3): 445-449; 1974.* (7 references)

Gas-liquid chromatographic methods are presented for the determination of de-*N*-methyl dimethoate, *N*-hydroxymethyl dimethoate, de-*N*-methyl dimethoxon, *N*-hydroxymethyl dimethoxon, and the *O*-glucoside of *N*-hydroxymethyl dimethoate in grapes at levels down to 0.05 ppm for each compound. Recovery values for all these compounds are presented. Analyses of field-treated grape samples harvested 28 days after the last application of dimethoate showed no residues of any of these compounds at or above the validated sensitivity limit (0.05 ppm) of the method, indicating that they do not constitute a significant part of the dimethoate-related residues in grapes. Synthesis and isolation procedures used to obtain *N*-hydroxymethyl dimethoate, *N*-hydroxymethyl dimethoxon, de-*N*-methyl dimethoxon, and *N*-hydroxymethyl dimethoate *O*-glucoside are also described. (Author abstract reprinted by permission of the American Chemical Society)

74-1971. Spurr, H. W., Jr.; Sousa, A. A. (Oxford Tobacco Res. Lab., Southern Region, Agr. Res. Serv., U.S. Dept. Agr., Oxford, NC 27565). **Potential interactions of aldicarb and its metabolites on nontarget organisms in the environment.** *J. Environ. Qual. 3(2): 130-133; 1974.* (15 references)

Laboratory evaluations were conducted with aldicarb pesticide and its metabolic degradation products to determine their effects on selected plants, insects and microorganisms. Except for aldicarb, aldicarb sulfoxide and aldicarb sulfone, which were toxic to insects and nematodes, none of the aldicarb metabolites were significantly toxic to the test organisms studied. The metabolic utilization of aldicarb by certain microorganisms should increase the rate of detoxification and result in the rapid dissipation of residues. The results imply that the growth of soil microorganisms should not be affected adversely by the concentrations of aldicarb applied for pest control. (Author abstract by permission)

74-1972. Tomatis, L.; Turusov, V.; Charles, R. T.; Boicchi, M. (International Agency Res. Cancer, Lyon, France). **Effect of long-term exposure to 1,1-dichloro-2,2-bis(*p*-chlorophenyl)-ethylene, to 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane, and to the two chemicals combined on CF-1 mice.** *J. Nat. Cancer Inst. 52(3): 883-891; 1974.* (28 references)

Male and female CF-1 mice were maintained for up to 130 weeks on diets containing 250 ppm *p,p'*-DDE or *p,p'*-DDD (TDE) or 125 ppm of the two chemicals combined. Exposure to *p,p'*-DDE resulted in a high incidence and early appearance of liver tumors, particularly in the female mice. Liver tumors appeared in 1% of the untreated females and 100% of the treated females. Exposure to *p,p'*-DDD moderately increased the incidence of liver tumors in males only and markedly increased the incidence of lung tumors in both sexes. Exposure to both chemicals combined resulted in a marked increase in the incidence of liver tumors in both sexes and in the early appearance of such tumors. The storage levels of these metabolites were higher in the fat tissue than in the liver or kidneys, and the storage concentration of *p,p'*-DDE was higher than that of *p,p'*-DDD following the same exposure levels.

74-1973. McKim, J. M.; Cristensen, G. M.; Tucker, J. H.; Lewis, M. J. (Natl. Water Quality Lab., EPA, Duluth, MN). **Effects of pollution on freshwater fish.** *J. Water Pollut. Contr. Fed. 45(6): 1370-1407; 1973.* (375 references)

The effects of pollution on freshwater fish are reviewed in terms of the effects of metals, pesticides, detergents, and industrial wastes; chemical and biological methods for identifying and determining the effects of these compounds; water quality, including salinity, oxygen, and pH; insecticides, herbicides, and piscicides as pollutants; organic, polychlorinated biphenyl, metal, and pulp and paper industrial pollutants; domestic pollutants; and radioactive pollutants. Extensive literature reviews on toxicology and analysis of pesticides in water have appeared during the past year.

74-1974. Oshima, H.; Imai, M.; Kawagishi, T. (Res. Inst. of Industrial Medicine, Faculty of Med., Mie Prefectural Univ., Tsu, Mie, Japan). **[On the toxicity of *n*-butyl and**

allyl 2-methyl-4-chlorophenoxyacetate, two herbicidal MCP esters.] *Mie Igaku (Mie Med. Sci.) 17(2): 95-100; 1974.* (8 references) (Japanese)

The acute oral toxicity (LD50) of *n*-butyl 2-methyl-4-chlorophenoxyacetate administered by stomach tube as a suspension in olive oil to male ICR mice was 1182 mg/kg and to male Wistar rats was 914 mg/kg. The LD50 of allyl 2-methyl-4-methyl-4-chlorophenoxyacetate similarly administered was 1050 mg/kg (male ICR mice), 987 mg/kg (female ICR mice), 612 mg/kg (male Wistar rats), and 962 mg/kg (female rats). The animals were observed for seven days after treatment. Histopathological findings included slight congestion in the livers and kidneys of dead animals. In subacute toxicity tests in which the *n*-butyl ester was administered at levels of 40-3240 ppm and the allyl ester was administered at the level of 10-2560 ppm in the diet for three months to groups of male and female ICR mice and Wistar rats, the maximum no-effect level was 120 ppm for the *n*-butyl ester and 160 ppm for the allyl ester. Retardation of weight gain, increases in urine coproporphyrin, anemia, slight disturbances of liver function, increased liver weight, and acidophilic denaturation of hepatic cells were the major effect observed in the groups administered higher levels of both esters. When 3, 6, and 12% solutions of the esters in olive oil were applied to the shaved skin of rats, no effects were seen with the 3% solution of both esters after one month.

74-1975. Chambers, H.; Fabacher, D. L. (Author address not given). **Acute toxicity of pesticides to channel catfish fingerlings.** *Miss. Agr. Forest. Exp. Sta. 37(2): 1; 1974.*

Channel catfish fingerlings (*Ictalurus punctatus*) were maintained in tanks of continuously flowing dechlorinated tap water to which dimethoate, propanil, and Sencor, diluted in acetone, were added at a rate of 1 ml acetone/liter of water. Pesticide concentrations ranged from 2.0 to 20.0 ppm. Sencor was nontoxic to catfish at all concentrations tested; environmental concentrations greater than 20 ppm would be unlikely to occur. Propanil caused 16.6% mortality at the 20 ppm concentration; lower concentrations were nontoxic. It is unlikely that concentrations of 20 ppm would be encountered in catfish ponds. The mortality rate with dimethoate ranged from 5.5% at 2 ppm to 100% at 20 ppm. It is unlikely that current rates of application would lead to the accumulation of lethal concentrations of dimethoate in the environment. Since the study was conducted under laboratory conditions, the toxicity data may vary under environmental conditions.

74-1976. Brade, W. P.; Chiu, J. F.; Hnilica, L. S. (Dept. Biochem., Univ. Texas, Houston, TX 77025). **Phosphorylation of rat liver nuclear acidic phospho proteins after administration of α-1,2,3,4,5,6-hexachlorocyclohexane in vivo.** *Mol. Pharmacol. 10(3): 398-405; 1974.* (41 references)

α-1,2,3,4,5,6-Hexachlorocyclohexane (α-HCH,BHC) is known to induce mixed-function oxidases in rat liver endoplasmic reticulum and to stimulate liver cell proliferation. During the 12 hr after administration of α-HCH the phosphorylation of nuclear acidic proteins in vivo increased to about twice the control level. Essentially all of the increased phosphorylation after α-HCH in vivo involved preferential ^{32}P incorporation into fractions of phenol-soluble acidic chromatin proteins, resolved by polyacrylamide gel electrophoresis into proteins with estimated molecular weights of 15,000-25,000, 35,000-50,000, and 60,000-90,000. Although no qualitative changes in the electrophoretograms of phenol-soluble acidic chromatin proteins were observed, the incorporation of radioactive amino acids into the acidic protein fraction of rat liver nuclei in vivo increased 6 hr after α-HCH, suggesting a change in turnover or an increased number of phosphate acceptor sites at the time of maximal phosphorylation of acidic nuclear phospho proteins. (Author abstract by permission of Academic Press)

74-1977. Tsuda, H.; Takahashi, M.; Fukushima, S.; Endo, Y.; Hidosaka, Y. (1st Dept. Pathol., Nagoya City Univ. Med. Sch., Nagoya, Japan). **Fine structure and localization of peroxidase activity in aminotriazole goiter.** *Nagoya Med. J. 18(3): 183-190; 1973.* (15 references)

Goiters were produced in female Wistar rats by the oral administration of 3-amino-1,2,4-triazole (amitrole) at a dose level of 5 mg/ml drinking water for three days. On light microscopic examination, alterations in the goitrous gland consisted of a decrease in the colloid content of the follicular lumina, irregular arrangement of the gland, and papillary proliferations of the follicular epithelia into the lumina. Electron microscopy revealed a slight distention and a small decrease in the peroxidase activity of the cisterna of the endoplasmic reticulum; these changes were seen early in the treatment period. As the goiter developed, the follicular cell became cuboidal to columnar, and the nucleus lay basally. The endoplasmic reticulum dilated widely, and staining was negative for peroxidase activity. Elongated microvilli projected into the follicular lumen and the perinuclear cisterna, initially unaffected, showed no peroxidase activity.

74-1978. Hirono, K. (Dept. Internal Med., Niigata Rinko Hospital, Niigata, Japan). **[Clinical and experimental studies on pneumonitis caused by pesticides. Part 2. Experimental study.]** *Niigata Igakkai Zasshi (Niigata Med. J.) 88(2): 70-75; 1974.* (9 references) (Japanese)

Adult rabbits with body weight of about two kg were divided into six groups and injected (trachea) with 1 ml of diluted (by sterilized distilled water) Blasticidin-S at a concentration of 0.0001, 0.001, 0.01, 0.1, 1.0 and 10 μg/ml to four rabbits in each group. Animals were sacrificed after one, three, five, and seven days of injection to examine lung specimens. Another two groups of rabbits treated with 1 and 100 μg/ml, respectively were sacrificed 14, 21, and 28 days after injection. Still other groups were treated three times every 10 days with 0.1 μg/ml and two times every 10 days with 10 μg/ml. Pathological changes appeared only in groups treated with more than 0.1 μg/ml using microscopic and electron microscopic examination. Pathological changes were more serious and the recovery delayed as the concentration increased. Alveoli were destroyed by the injection; however, the proliferation of cells began from the neighboring bronchioles, and the formation of glandular structure and the regeneration of alveoli were observed. No marked difference was observed between the animals repeatedly treated and the effects produced by administering prednin (5 mg/day for three and seven days) after the Blasticidin-S injection. However, epithelial proliferation and bronchial pneumonia-like symptoms were observed.

74-1979. Imai, H. (School of Ophthalmol., Kitasato Univ., Sagamihara, Kanagawa, Japan) **[Studies on the ocular toxicity of organophosphorus pesticides. Part I. Electroretinographic and biochemical study on rats after a single administration of fenthion.]** *Nippon Ganka Gakkai Zasshi (J. Jap. Ophthalmol. Soc.) 78(4): 163-172; 1974.* (21 references) (Japanese)

Fenthion in olive oil was injected subcutaneously on the back of male Wistar rats, normal in ERG, once at the respective dose rates of 0.005, 0.05, 0.5, 5, 25, 50, 100 and 500 mg/kg. The ERG and cerebral, retinal and cerebellar cholinesterase activities were recorded four days after the injection. The minimum effective concentration of fenthion according to the ERG was 0.005 mg/kg, or one sixty-thousandth of the LD50 p.o. At levels below 5 mg/kg increases in the amplitudes of α- and β-waves and decreases in the latency time and the peak time of α-waves coincided with more than 50% of normal acetylcholinesterase activity suggesting a change in facilitation upon a slight disturbance of ChE activity. After administration of more than 50 mg/kg, the retinal acetylcholinesterase activity disappeared completely and the ERG was subnormal. All time parameters were elongated, probably due to the accumulated acetylcholine intoxication.

74-1980. Miyata, M.; Amai, H.; Ishikawa, S. (School of Ophthalmol., Faculty of Med., Kitasato Univ., Sagamihara, Kanagawa, Japan). **[Cholinesterase in rat retina, and the effects of an organophosphorus compound, fenthion, on it.]** *Nippon Ganka Kiyo (J. Jap. Ophthalmol.) 25(1): 89-93; 1974.* (14 references) (Japanese)

As the first step in elucidating the mechanism of change in wave form of the electroretinogram (ERG), the authors studied the location and properties of cholinesterase in the rat retina and the effects of an organophosphorus compound, fenthion, on the cholinesterase. Adult male Wistar rats were killed by cervical dislocation and exsanguination. Their retinas were removed and homogenized. The ChE in the retina hydrolyzed acetylthiocholine iodide swifty; its activity was inhibited very little by iso-OMPA but inhibited 87% upon addition of caffeine. It did not hydrolyze butylthiocholine iodide. On the other hand, although the pigmentary epithelium ChE hydrolyzed acetylthiocholine iodide, it was inhibited profoundly by $10^{-4}M$ of iso-OMPA, was not inhibited by caffeine, and hydrolyzed butylthiocholine iodide fairly swiftly. From the above findings, it was concluded that acetylcholinesterase was present in the rat retina and pseudocholinesterase in the rat pigmentary epithelial layer. Histochemically, pseudocholinesterase was recognized only in the ganglionic cell layer, inner reticular layer, and pigmentary epithelium by the Gomori method; however, its presence in the outer reticular layer and inner segment of visual cells was revealed by the Crevier and Belanger method. A slight inhibition of pseudocholinesterase was recognized histochemically after administration of fenthion at 5 mg/kg and complete inhibition at 100 mg/kg.

74-1981. Singh, K.; Gulati, K. C. (U.P. Inst. of Agr. Sci., Kanpur-2, India). **A study on the effects of Di-Syston and Thimet on soil micro-organisms, ammonification and nitrification in soil.** *Pesticides 6(6): 24, 25, 29, 1972.* (10 references)

No changes were seen in the counts of total bacteria, fungi, and Azotobacter in rhizosphere and non-rhizosphere soils after treatment with Di-Syston (disulfoton) at 0.5-1.5 g/30 cm row. The biological half-life of disulfoton in soil is ca. 6-8 days; the first sample was examined 15 days after insecticide treatment. No metabolite toxic to soil microorganisms was formed. The quantity of ammoniacal nitrogen was less in thimet- and disulfoton-treated samples than in controls. Both disulfoton and thimet at 100 ppm inhibited nitrification. The depression of ammonifier and nitrifier growth was not prolonged.

74-1982. Zeitoun, R.; Makar, A. B. (Dept. Pharmacol., Fac. Pharmacy, Alexandria Univ., Alexandria, Egypt). **Effect of 2-diethylaminoethyl-2,2-diphenylvalerate hydrochloride on the uterotropic action of *o,p'*-DDT.** *Pharmazie 28(10): 673-675; 1973.* (16 references)

Adult ovariectomized Sprague-Dawley rats which had been pretreated with saline or SKF 525-A were injected with *o,p'*-DDT. DDT increased the uterine wet weight 16.5 and 35.2% at 4 and 6 hours, respectively, after treatment. SKF 525-A raised these values to 34.8

and 62.7%, respectively. SKF 525-A also intensified the increase in the uterine water content and the decrease in the uterine protein content caused by DDT. Similar changes were not seen in the liver, spleen, or diaphragm. The data do not support the hypothesis that *o,p'*-DDT is active only after being metabolized by hepatic enzymes. Rather, they indicate that *o,p'*-DDT is the active species and that its metabolism by microsomal enzymes leads to the formation of less active metabolites.

74-1983. Zeitoun, R.; Makar, A. B. (Dept. Pharmacol., Fac. Pharmacy, Alexandria Univ., Alexandria, Egypt). **Effect of phenobarbital sodium on the uterotropic action of *o,p'*-DDT.** *Pharmazie 28(10): 675-676; 1973.* (11 references)

Adult ovariectomized Sprague-Dawley rats which had been pretreated with saline or phenobarbital were injected with *o,p'*-DDT. The phenobarbital pretreatment tended to inhibit the uterotropic activity of *o,p'*-DDT. The uterine wet weight in the phenobarbital treated animals increased by 9% four hours after DDT injection, as compared with 16.5% in the saline treated animals. Values after six hours were 28 and 36%, respectively. However, at each time interval, the values obtained from the saline and phenobarbital treated rats were not statistically different from each other. Phenobarbital also slightly inhibited the accumulation of water and the decrease in the protein concentration of the uterine tissue caused by *o,p'*-DDT. The data indicates that the metabolism of *o,p'*-DDT by hepatic enzymes may lead to the formation of less active, or almost equally active, substances.

74-1984. Luard, E. J. (Dept. Biol., San Diego St. Univ., San Diego, CA). **Sensitivity of *Dunaliella* and *Scenedesmus* (Chlorophyceae) to chlorinated hydrocarbons.** *Phycologia 12(1/2): 29-33; 1973.* (14 references)

Dunaliella tertiolecta and *Scenedesmus quadricauda*, two morphologically dissimilar algal species, were tested for resistance to chlorinated hydrocarbons, as measured by carbon-14 uptake. Samples of both species were incubated with varying concentrations of DDT, DDE, DDD, or PCB. Neither species was significantly affected by DDT or its analogs, while both species were sensitive to PCBs. The results suggest the presence of a sensitive selection mechanism, presumably at the cell membrane or chloroplast membrane.

74-1985. McBlain, W. A.; Lewin, V.; Wolfe, F. H. (Dept. of Zool., Univ. of Alberta, Edmonton, Alberta, T6G 2E1, Canada). **Limited accumulation of DDT in eggs, fat and livers of Japanese quail.** *Poultry Sci. 53(1): 84-88; 1974.* (19 references)

Laying Japanese quail were dosed with 9 mg/kg/day of *p,p'*-DDT. Levels of residues of *p,p'*-DDT, DDE, and DDD (TDE) were monitored over 101 days in eggs, omental fat, and livers. A plateau of residues was established in eggs and fat after about 6 weeks. Although magnification of residues was also limited in livers, the pattern was less clear. Conversions of the DDT to DDE and DDD were observed, and it is suggested that the conversion to DDD may represent an expedient metabolic and excretory pathway due to its apparently limited distribution in the body. Egg production, egg weight, and egg shell thickness were not altered during the course of the experiment. (Author abstract by permission)

74-1986. Komissarenko, V. P.; Chelnakova, I. S. (Kiev Sci. Res. Inst. Endocrinol. and Metabolism, Kiev, USSR). **Izucheniye sekretsii al'dosterona u sobak, poluchavshikh *o,p'*-dikhlordifenil-dikhloretan (*o,p'*-DDD). [A study of aldosterone secretion in dogs given *o,p'*-dichlorodiphenyldichloroethane (*o,p'*-DDD).]** *Probl. Endokrinol. 19(5): 72-76; 1973.* (19 references) (Russian)

Dogs were administered single i.v. injection of 50 mg/kg *o,p'*-DDD (TDE) or daily oral 50 mg/kg doses for 5 or 14 days to study the effect of *o,p'*-DDD on the aldolase secretion by the adrenal glands. A single i.v. injection and prolonged oral administration of *o,p'*-DDD reduced aldosterone secretion to very low or undetectable levels (below 0.1 μg). The weight of the adrenal glands decreased by over 50% after 14 day treatment. The rate of adrenal circulation failed to alter either in oral or i.v. administration of the preparation. Pronounced changes in the structure of the mitochondria, including rarefaction and swelling, and deformation and structural changes of the cristae were observed. The suppression of the aldosterone secretion in the adrenal glands by *o,p'*-DDD is most probably due to the inhibition of the pregnenolone formation by this preparation.

74-1987. Kravchenko, V. I. (Lab. Pathol. Physiol., Kiev Sci. Res. Inst. Endocrinol. and Metabolism, Kiev, USSR). **Vliyaniye *o,p'*-DDD na obrazovaniye kortikosteroidov nadpochechnikovoy tkan'yu in vitro. [The effect of *o,p'*-DDD on the formation of corticosteroids by the adrenal tissue in vitro.]** *Probl. Endokrinol. 19(5): 76-79; 1973.* (5 references) (Russian)

The effect of 1, 3, 6, 18, and 30 μmol concentrations of *o,p'*-DDD (TDE) on the corticosteroid formation in slices and homogenates of adrenocortical tissues from adult dogs, rats, chickens, and from human fetuses was studied in vitro. The cultures were incubated in the presence of progesterone or desoxycorticosterone. The content of 11-hydroxycorticosteriods in the incubation media was determined by De Moor's fluorimetric method. Corticosteroid production did not change under the effect of *o,p'*-DDD as evidenced by slices of dog and chicken adrenal glands. Under the same conditions the corticosteroid formation from progesterone in chicken

adrenal gland culture was reduced. *o,p'*-DDD distinctly inhibited corticosteroid formation from progesterone by adrenal gland homogenates of dogs, chickens, rats, and human fetuses. The biosynthesis of corticosterone from desoxycorticosterone was also reduced. The process of 11-beta-hydroxylation is supposed to constitute one of the stages of the inhibitory action of *o,p'*-DDD.

74-1988. Werderitsh, D. A.; Shelton, D.; Swan, C.; Haun, C. M.; Yunghans, W.; Morre, D. J. (Dept. Botany Plant Pathol., Purdue Univ., Lafayette, IN 47907). **Toxic response of mice to DDT diet, its suppression by feeding and the effect of estrogen.** *Proc. Indiana Acad. Sci. 81: 101-102; 1972.*

DDT, fed to mice at 900 ppm in the diet, caused tremors within five days and death three days after the onset of severe symptoms. Withdrawal from the DDT feed in the initial stages of tremor development resulted in recovery within 8 to 12 hr, but fasting of these animals after several weeks caused a reappearance of symptoms. The toxic response to DDT was not prevented, reversed, or significantly delayed by administration of estrogen.

74-1989. Elder, J. H.; Lembi, C. C.; Anderson, L.; Morre, D. J. (Dept. Botany Plant Pathol., Purdue Univ., Lafayette, IN 47907). **Scale calcification in a chrysophycean alga: a test system for the effects of DDT on biological calcification.** *Proc. Indiana Acad. Sci. 81: 106-113; 1972.* (24 references)

Cultures of *Coccolithus huxleyi* (Lohm.) were grown in the presence or absence of technical grade DDT to determine the influence of DDT on calcification in the algal system. The calcification of scales was markedly reduced in cells grown in the presence of DDT. DDT also inhibited the activity of carbonic anhydrase in these cells, the levels of DDT required to do so being high. Calcium utilization was inhibited by 10 to 15% in the DDT treated cells.

74-1990. Lichtenstein, E. P. (Dept. Entomol., Univ. Wisconsin, Madison, WI 53706). **Environmental factors affecting penetration and translocation of insecticides from soils into crops.** *Qual. Pl. Plant Foods Hum. Nutr. 23(1/3): 113-118; 1973.* (24 references)

Penetration and translocation of insecticides from soils into crops are influenced by soil type, insecticide, crop, and nutritional state of the plant. Carbon added to soils in the laboratory reduced penetration of organochlorine insecticides into pea plants. Binding of pesticide residues to the carbon-soil complex increased with time. Field results were similar to but not as striking as the laboratory results. Carbon treatment could permit the use of even heavily insecticide-contaminated soils for crop growth. Residues of some pesticides are metabolized by plant enzymes into other compounds having undetermined biological activity.

74-1991. Godfrain, J. C.; Rico, A. G.; Burgat-Sacaze, V.; Ben M'Lih, D.; Braun, J. P.; Benard, P. (Ecole Nationale Veterinaire, Pharmacie et Toxicologie, 31076 Toulouse Cedex, France). **Recherche des effets toxiques chez la caille du methyl-mercure et de methoxy-ethyl-mercure, fongicides organo-mercuriels. [Research of toxic effects on the quail of methyl mercury and methoxyethyl mercury, organo-mercurial fungicides.]** *Rev. Med. Vet. (Toulouse) 124(8-9): 1019-1039; 1973.* (16 references) (French)

The subacute toxicity of methylmercury and methoxyethyl mercury fungicides was studied in quail 5-weeks-old. The animals were fed grains containing ppm of methyl mercury and methoxyethyl mercury silicate (Ceregam), respectively, for 15 days. Total anorexia and cachexia and a 15-day mortality of 60% were determined in the group fed methyl mercury-containing grains. Progressive anorexia, but increased gain of weight were observed in the group fed Ceregam-contaminated grain. Animals which ingested methyl mercury exhibited hypertrophy of the liver, kidney, and intestines; edema of the brain; and immaturity of the genitals. Quails fed Ceregam displayed enteritis, fatty degeneration of the liver, and nephritis. The latter group also showed reduced creatinine, albumin, and uric acid levels. The quails fed methyl mercury-containing grain showed increased cholesterol, total protein, creatinine, and albumin levels and lowered uric acid level. The mercury residue, determined on the 16th day of the experiment in the livers, kidneys, and brains of the methyl mercury-treated animals, was 154 ppm, 128 ppm, and 48 ppm, respectively. The highest mercury levels in the corresponding organs of the Ceregam-treated quails were 29 ppm, 40 ppm, and 3.31 ppm. Methyl mercury was a nerve poison, while Ceregam primarily caused renal lesions.

74-1992. Yamada, T. (Division of Agr. Chem., Sankyo Co. Ltd., Tokyo, Japan). **[Kuzuknock minute granule, a new foliage application herbicide against *Pueraria lobata.*]** *Ringyo To Yakuzai (Forest. Pharm.) 47: 9-15; 1974.* (11 references) (Japanese)

Kuzuknock contains 2% of tetrapion, sodium 2,2,3,3-tetrafluoropropionate, and 5% of sodium 2,2-dichloropropionate (Dalapon-Na) combined as active ingredients and is applied at a rate of 100 kg/ha against *Pueraria lobata*. The toxicity of the first ingredient was studied. The acute oral LD50s to rats, mice, rabbits, and quail are 8,570-11,900, 9,236-9,816, 8,000-9,800, and 6,750-11,000 mg/kg. TLm to young carp is 20,000 ppm; however, carp, eel, and loach all survived for 10 days at 10,000 ppm, and young rainbow trout survived for 72 hr at 10,000 ppm. The accumulated amount corresponding to 13 times the LD50 value for rats administered for 90 days did not kill any rats. When tetrafluoropropionate was administered once at the rate of 10 and 100 mg/kg to rats about half was excreted into urine and feces via blood; no accumulation was seen in the internal organs

after 1-2 weeks. Hematological examination, urinalysis, and gross examination showed that the maximum no-effect dose was larger than 200 ppm. No teratogenic effects were seen in mice administered 4,000 mg/kg/day for six days. Experiments in quail and mice gave similar results. Residues in the milk of cows disappeared as quick as that in feces and urine of rats. Abnormalities were not found on the shaved skin of rats to which was applied 2,600 mg/kg and of rabbits receiving 2,000 mg/kg. However, after applications to human skin, the upper layer peeled off without pain after a few days.

74-1993. Shindo, H. (Author address not given). **Applications of whole body auto-radiography to the studies of drug metabolism and disposition.** *Sankyo Kenkyusho Nenpo (Annu. Rep. Sankyo Res. Lab.) 24: 1-72; 1972.* (85 references)

The application of the whole body autoradiographic technique to the study of drug metabolism and disposition is reviewed in terms of the method itself, the characteristics of whole-body autoradiography, its applications, and color autoradiography. The technique has been used to determine the metabolism and disposition of the various isomers of benzene hexachloride (BHC) in mice. The various isomers are distributed in varying amounts in the brain, liver, blood, and adipose tissues following i.p. administration. The various isomers are found in differing concentrations within the body tissues and are eliminated from these tissues at different rates. Whole-body autoradiography was also efficaciously applied to investigations into the penetration and distribution of BHC and nicotine in the American cockroach. Again, the various isomers of BHC behaved differently.

74-1994. Miyasaka, H.; Kobayashi, N. (Div. Plant Protect., Bureau of Agr., Sericult. and Horticult. Production, Min. of Agr. and Forestry, Tokyo, Japan). **[Three newly registered agricultural chemicals.]** *Shokubutsu Boeki (Plant Protect.) 28(4): 168-169; 1974.* (Japanese)

Properties, methods of application, and the toxicity of three recently registered agricultural chemicals are described. Acephate WP, containing 50% of *O,S*-dimethyl-*N*-acetylphosphoroamidothioate, has an LD50 (active ingredient p.o.) of 36 mg/kg to mouse, 945 mg/kg to male rat, 866 mg/kg to female rat and an LD50 (cutaneous) greater than 2000 mg/kg to rabbit. TLm 48 hr to young carp is 30 ppm and to shrimp 299 ppm. Prune, a plant growth regulator for lily, contains 25% of sodium dodecylbenzene sulfonate. The LD50 of active ingredient p.o. is 3680 mg/kg to mouse and 4000 mg/kg to rat; and LD50 cutaneous $>$ 20 g/kg to male rat. TLm 48 hr. to young carp is $>$ 20 ppm. Shionox WP, a plant growth regulator, contains 75% of hydrated silica and is used for controlling apple rust. The LD50 p.o. is $>$ 15 g/kg to male mouse, $>$ 22.5 g/kg to male rat. The TLm 48 hr for young carp is $>$ 1000 ppm.

74-1995. Hiltibran, R. C. (Illinois Natural History Survey, Urbana, IL). **Effects of the chlorogroups of phenoxy compounds on the oxidative phosphorylation.** *Trans. Ill. State Acad. Sci. 65(3-4): 81-85; 1972.* (9 references)

The effects of the sodium salts of phenoxyacetic acid, phenoxypropionic acid, 2-chlorophenoxyacetic acid (2-CPA), 4-chlorophenoxyacetic acid (4-CPA), 2,4-dichlorophenoxypropionic acid (dichlorprop), and 2,4-DB on the oxygen and phosphate uptake of bluegill liver mitochondria in the presence of succinate and alphaketoglutarate were investigated and compared with the effects of 2,4-D, 2,4,5-T, and silvex. The phenoxyacetic and phenoxypropionic acids did not alter the uptake of oxygen in the presence of either substrate. 2-CPA inhibited oxygen uptake more than the 4-CPA derivative and the dichloro-substituted phenoxyacetic acid. 2,4-D inhibited oxygen uptake to about the same extent as 4-CPA. The oxygen uptake was more severely inhibited by 2,4,5-T in the presence of both substrates, and dichlorprop inhibited oxygen uptake more than silvex. In the presence of succinate, the phenoxyacetic and phenoxypropionic acids increased phosphate uptake, which was decreased by both in the presence of alphaketoglutarate. The substituted chloro groups had no appreciable effect on phosphate metabolism.

74-1996. Gordiyenko, V. M.; Bogomolets, Ye. O.; Kozyritskiy, V. G. (Kiev. Sci. Res. Inst. Endocrinol. and Metabolism, Ministry of Public Health of the Ukrainian SSR, Kiev, USSR). **Elektronnomikroskopicheskoye issledovaniye shchitovidnoy zhelezy sobaki pri vvedenii razlichnykh doz orto, para, prim-dikhlordifenilkhloretana (*o,p'*-DDD). [Electron microscopic study of the dog thyroid gland following administration of different doses of *o,p'*-dichlorodiphenyldichloroethane (*o,p'*-DDD).]** *Tsitol. Genet. 6(5): 392-394; 1972.* (14 references) (Russian)

Changes in the fine structure and the function of the thyroid gland were studied in adult male dogs fed 10, 25, or 50 mg/kg doses of *o,p'*-DDD by electron microscopic technique and by measurement of the I^{131} uptake. Electron microscopic investigations revealed cells with projecting apical surface, formation of cisterns in the endoplasmic reticulum, and swollen and enlarged mitochondria with thickened cristae due to *o,p'*-DDD doses of 10 and 25 mg/kg. These changes, as well as the data obtained on I^{131} uptake and protein bound iodine levels, are indicative of thyroid hyperfunction due to *o,p'*-DDD administered at a rate of 25 mg/kg. When administered in a dose of 50 mg/kg, *o,p'*-DDD inhibited the thyroid function.

74-1997. Brusilovskiy, Ye. S.; Fialkovskiy, A. M. (Dept. Allergology, All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Eksperimental'noye izucheniye kozhno-allergicheskogo deystviya tetrametiltiuramdisul'fida. [Experimental study of the dermato-allergic effect of thiram.]** *Vestn. Dermatol. Venerol. 47(5): 28-31; 1973.* (16 references) (Russian)

The skin sensitizing effect of thiram was studied in rabbits. Sensitization was done by intracutaneous inoculation of 0.1 ml 0.5% thiram with or without 0.1 ml Freund's adjuvant, while another group was treated epicutaneously with 0.1 ml 2% thiram. Phenomena of contact dermatitis with erythema with or without infiltrations, and hyperemia were observed. Humoral hapten antibody was involved in the development of the contact dermatites. The antibody level was correlated with the intensity of the allergic process.

74-1998. Steen, R. C.; Schultz, I. R.; Zimmerman, D. C.; Fleeker, J. R.* (Dept. Biochem., North Dakota State Univ., Fargo, ND 58102). **Absence of 3-(2,4-dichlorophenoxy)propionic acid in plants treated with 2,4-dichlorophenoxyacetic acid.** *Weed Res. 14(1): 23-28; 1974.* (13 references)

Experiments were conducted to establish if the formation of 2,4-dichlorophenol (DCP) from 2,4-dichlorophenoxyacetic acid (2,4-D) in plants proceeds via 3-(2,4-dichlorophenoxy) propionic acid (2,4-DP) as an intermediate. Soybean (*Glycine max* (L.) Merr.), kidney bean (*Phaseolus vulgaris* L.), pea (*Pisum sativum* L.), smooth bromegrass (*Bromus inermis* Leyss.), wild oat (*Avena fatua* L.), yellow foxtail (*Setaria glauca* (L.) Beauv.), barley (*Hordeum vulgare* L.), timothy (*Phleum pratense* L.), and orchardgrass (*Dactylis glomerata* L.) were treated with equal weights of 2,4-D and 2,4-DP. After 3 days, all plants contained DCP; however, amounts were larger in plants treated with 2,4-DP than in those treated with 2,4-D. The 2,4-DP was absorbed from the leaf surface more efficiently than 2,4-D. No evidence was found for formation of 2,4-DP from 2,4-D in any of the plant species studied. (Author abstract by permission)

See also **74-1805 74-1815 74-1851 74-1871 74-1878 74-1889 74-1890**

74-1999. Hurley, J. T. (Author address not given). **Pesticide analysis in water.** *J. Amer. Water Works Ass. 66(1): 27-31; 1974.*

The increased use of pesticides has increased the possibility of contaminating water supplies. Aspects that are of importance in investigating the levels and types of pesticides in water are toxicity, extent of usage, persistence in the environment, biomagnification, and sensitivity of detection. Some of the classes of pesticides which are currently in use are chlorinated hydrocarbon pesticides, organophosphorus pesticides, carbamates, and phenoxy herbicides. Chlorinated hydrocarbon pesticides are extracted from water into an organic solvent such as hexane or methylene chloride. To remove interfering substances and to separate PCBs and phthalate esters, the concentrated extract is subjected to a column chromatography cleanup-and-separation procedure. The commonly used method of detection is electron-capture gas chromatography, which permits the detection of certain pesticides in the parts-per-trillion range. The detector is sensitive to halogenated hydrocarbon pesticides, PCBs, phthalate esters, some organophosphate pesticides, and some other materials. The chromatographs can be used for qualitative and quantitative determinations. Water supplies investigated so far have only trace amounts of chlorinated hydrocarbon pesticides.

74-2000. Murray, A. J.; Riley, J. P. (Dept. of Oceanogr., Univ. of Liverpool, P.O. Box 147, Liverpool, L69 3 BX, England). **The determination of chlorinated aliphatic hydrocarbons in air, natural waters, marine organisms, and sediments.** *Anal. Chim. Acta 65(2): 261-270; 1973.* (2 references)

In the described procedure for the nearly quantitative extraction and determination of chlorinated aliphatic hydrocarbons, the Cl compounds are stripped from water samples by bubbling with nitrogen, from aquatic organisms or sediments by heating in a nitrogen current, and from air samples by passage through activated carbon traps and subsequent desorption by heating in nitrogen. In either case, the halogen compounds are trapped in copper columns packed with Chromosorb coated with a silicone oil, and cooled to -78C. The columns are swept out with argon into a gas chromatographic column, and the chromatogram peaks are ascertained with an electron-capture detector. Among Cl compounds thus found in air and water samples were carbon tetrachloride, chloroform, trichloroethylene, and perchloroethylene. Their concentration in waters sampled away from industrial areas ranged from 0.5 to 18.5 ng/liter, in air samples from 2.5 to 6.5 ng/cu m. In samples from urban areas, the concentrations were one to two orders of magnitude higher. Significant amounts of these plus other unidentified Cl compounds were also observed in mollusc tissues and estuarine sediments. Minor amounts of short-chain halogen compounds, such as methyl chloride and dichlorodifluoromethane, were also detected, especially in air samples. (Author abstract by permission)

74-2001. Segebade, C. (Laboratorium 6.33 "Anwendung von Radionukliden", Bundesanstalt fuer Materialpruefung, Berlin-Dahlem, Germany). **Sorbentien als Hilfsmittel bei der Neutronaktivierungsanalyse von Fluessigkeiten. [Sorbents as an aid in the neutron-activation analysis of liquids.]** *Anal. Chim. Acta 67(1): 216-219; 1973.* (4 references) (German)

The use of sorbents, such as alumina, activated carbon, cellulose, mercury bromide, and mercury iodide, for the neutron-activation analysis of certain compounds in liquids, including extracts, is described. Mercury bromide and mercury iodide are suitable as sorbents for the neutron-activation analysis of plant-protecting agents containing chlorine and bromine in their molecules. Cellulose is unsuitable for the determination of compounds in which the activated nuclides have a short half-life period. Also, cellulose and alumina interfere with the determination due to their oxygen backgrounds.

74-2002. Thier, H. P. (Inst. fuer Angewandte Chemie, Universitaet Erlangen-Nuernberg, Erlangen, Germany). **Analytik der Herbizide. [Analysis of herbicides.]** *Angew. Chem. 86(7): 244-251; 1974.* (92 references) (German)

Procedures currently used for the extraction, cleanup, and quantitative determination of herbicide residues in soil, plant, and water samples are reviewed. Liposoluble herbicides are extracted by means of solvents miscible with water, such as acetone, methanol, or acetonitrile. Following vacuum concentration, the aqueous extract is purified by means of petroleum ether, ether, methylene chloride, or chloroform. It is relatively simple to separate organic impurities such as waxes, fats, and aromatics from herbicides containing free carboxy, phenolic hydroxy, or amino groups in their molecules. In many cases, however, chromatographic cleanup by means of alumina or magnesium silicate is unavoidable. Quantitative determination by IR spectrometry, mass spectrometry, or polarography is often impeded by the presence of trace impurities. Photometric and colorimetric methods are widely used for the determination of such herbicides as dinitrophenol derivatives, dipyridine compounds, preparations with free aromatic amino groups, carbanilic acid esters, *N*-phenylurea derivatives, and alpha-naphthylacetic acid. Gas-chromatographic methods by the use of high-sensitivity specific detectors, such as microcoulometric, Coulson's, thermionic nitrogen detector, or electron capture detector are most extensively used in herbicide analysis. Electron capture detectors are especially suitable for the determination of chlorophenoxycarboxylic acid derivatives.

74-2003. De Clercq, H.; Mertens, J.; Massart, D. L. (Farmaceutisch Instituut, Vrije Universiteit Brussels, Brussels, Belgium). **Fluoride selective electrode procedure for fluorated organophosphate cholinesterase inhib-**

itors. *Arch. Toxikol. 31(2): 185-191; 1973.* (10 references)

A fluoride selective electrode was used with manual and automatic procedures to measure sarin in solution following alkaline hydrolysis. The results achieved were in excellent agreement with those obtained using a manual version of the automated indirect colorimetric method of Voss. Enzymatic hydrolysis (acetylcholinesterase) measured with an enzyme electrode yielded no results. Thus, the assumption that sarin loses F^- upon reaction with cholinesterase was shown to be incorrect. Measurement with ion-selective electrodes after alkaline hydrolysis can probably be used to determine sarin and other haloorganophosphates such as soman and DFP which carry a F^- group and tabun which carries a CN^- group.

74-2004. Struble, D. L. (Res. Sta., Canada Dept. Agr., Lethbridge, Canada). **Analysis of aldrin in the presence of sulfur by electron capture gas chromatography.** *Bull. Environ. Contam. Toxicol. 11(3): 231-232; 1974.* (9 references)

An improved liquid phase for the direct gas-liquid chromatographic analysis of aldrin in the presence of sulfur is described. Sulfur is not detectable on Apiezon L liquid phase until the column is saturated (about 300 ng sulfur), at which point sulfur appears as a single peak at 22.8 min; this interferes with the analysis of DDE. The column was freed of sulfur by allowing it to remain at operating temperature overnight. Apiezon N and M liquid phases give similar results, but are saturated by smaller quantities of sulfur. A Varian Model 600D gas chromatograph was used with a tritium ECD and a 2 mm ID glass column with a glass injector liner.

74-2005. McKone, C. E.; Cotterill, E. G. (Agr. Res. Council, Weed Res. Org., Yarnton, Oxford, Great Britain). **Extraction of picloram residues from a sandy loam soil.** *Bull. Environ. Contam. Toxicol. 11(3): 233-237; 1974.* (8 references)

Picloram was recovered from sandy loam soil which had been treated with 24 oz/ac picloram 67 weeks previously and from soil which had been spiked in the laboratory. The pesticide was extracted with potassium chloride solutions of varying pH. Below pH 8 the residue was below the limit of detection (0.001 ppm), while above pH 8, the extractable picloram increased almost linearly to 0.038 ppm at pH 11.6. When soil spiked with 0.05 ppm picloram was extracted, recovery ranged from 60% at pH 7.2 to 96% at pH 11.6. Saturated calcium hydroxide solutions (pH 12.4) were also effective for the extraction of field weathered residues of picloram.

74-2006. Chiba, M.; Doornbos, F. (Res. Sta., Agr. Canada, Vineland Sta., Canada). **Instability of benomyl in various conditions.** *Bull. Environ. Contam. Toxicol. 11(3): 273-274; 1974.* (10 references)

When benomyl is prepared in solution with chloroform, acetonitrile, carbon tetrachloride, methanol, 2-propanol, or toluene, a white precipitate forms at room temperature. The quantity of precipitate is almost inversely related to the length of time needed for initial precipitate formation. In all cases, the precipitate is identifiable as methyl 2-benzimidazole carbamate (MBC). MBC showed limited solubility in all solvents tested. MBC converted from benomyl at residue levels would probably not precipitate from solutions. Thin-layer chromatography offers the more effective means of quantifying the amounts of benomyl and MBC. Benomyl also appears to be heat labile.

74-2007. Nitz, S.; Parlar, H.; Korte, F. (Inst. fuer Oekologische Chemie, Technische Universitaet Muenchen, Freising-Weihenstephan, Germany). **Beitraege zur Oekologischen Chemie LXXII. Analytisches Verhalten von Endo-Dieldrin und Endo-Photodieldrin. [Contributions to ecological chemistry 72: Analytical behavior of endo-dieldrin and endo-photodieldrin.]** *Chemosphere 3(2): 83-88; 1974.* (4 references) (German)

The analytical behavior of endo-dieldrin, obtained by the addition of acetylhypoiodide and subsequent saponification with sodium alcoholate, and of endo-photodieldrin, obtained by irradiation at wavelengths over 300 nm, was studied. It was not possible to separate endo-dieldrin from exo-dieldrin and endo-photodieldrin from exo-photodieldrin by thin-layer chromatography. Good separation of the respective isomers was achieved by gas chromatography, using 3% OV 101 on Chromosorb WAW-DMCS 80/100 at a column temperature of 180 C, nitrogen as carrier gas, and flame-ionization detector.

74-2008. Bazzi, B.; Fabrini, R.; Radice, M. (Author address not given). **Thin layer chromatographic-gravimetric determination of *O,O*-diethyl *S*-(*N*-isopropylcarbamoylmethyl) phosphorothiolothionate (prothoate) in technical products and liquid formulations.** *Contrib. Ist. Ric. Agr. Milan 11: 47-50; 1972.* (8 references)

Prothoate has been successfully assayed in technical products and liquid formulations using a TLC separation followed by phosphorus determination. The material, dissolved in benzene, was spotted on a silica plate, carried in a hexane-acetone solvent system and made visible using paladium chloride in HCl. The separated prothoate was removed from the plate, digested in a Kjeldahl flask, and the phosphorus precipitated with citric-molybdic acid reagent or quimociac reagent for gravimetric analysis.

74-2009. Bazzi, B.; Abbruzzese, L.; Galluzzi, G.; Nesti, V. (Author address not given). **Gas-chromatographic determination of the residues of 2-fluoroethyl-4-**

biphenyl-acetate (fluenethyl) in/on apples and pears. *Contrib. Ist. Ric. Agr. Milan 11: 51-56; 1972.* (11 references)

A method which involves bromination of the pesticide and subsequent electron capture GC analysis has been developed for the determination of fluenethyl residues on fruit. Residues were extracted into benzene, partitioned between acetonitrile and hexane, and brominated in a solution containing 0.1 ml of 2% I_2 in CCl_4 and 0.1 ml Br_2. Recoveries of 0.005 ppm fluenethyl added to apple, pear, and peach pulp ranged from 67 to 88%. None of the pesticides currently used on these fruits or metabolites of fluenethyl interfered with the assay.

74-2010. Kettmann, R.; Closset, J. L.; Copin, A.; Duculot, C.; Martens, P. (Chaire de Physique et Chimie Physique, Fac. des Sciences Agron., Gembloux, Belgium). **Application de la spectrometrie par reflexion totale attenuee dans l'infrarouge a l'etude des residus de quelques produits phytopharmaceutiques. [Application of spectrometry by total attenuated reflection in the infrared to the study of residues of some phytopharmaceutical products.]** *C. R. Acad. Sci., Ser. D 277(11): 967-969; 1973.* (4 references) (French)

The possibility of the application of spectrometry by total attenuated reflection in the infrared to the quantitative analysis of pesticide residues in plants was studied. Endosulfan and thiram residues in *Lactuca sativa* L. and quintozene residues in *Chicorium intybus* L. ssp. sativum were determined. Following extraction, the plant extract was subjected to double purification on Florisil column and on thin layer, after which the samples were transferred onto KRS-5 crystal giving 13 reflections in an apparatus described by T. Avella and C. Duculot. The spectrometric method studied proved to be suitable for the determination of endosulfan, thiram, and quintozene residues in the ppm range.

74-2011. Ebel, S.; Herold, G. (Abteilung fuer analytische Chemie, Philipps-Univ. Marburg, Marburg, Germany). **Quantitative Bestimmung von Thiabendazol durch direkte Fluoreszenzauswertung nach duenschichtchromatographischer Trennung. [Qualitative determination of thiabendazole by direct fluorescence estimation after TLC separation.]** *Deut. Lebensm.-Rundsch. 70(4): 133-136; 1974.* (6 references) (German)

A method is described for the quantitative analysis of thiabendazole residues in citrus fruits and bananas. Direct fluorescence estimation through integration of the fluorescence position curve directly from the thin-layer plate after thin-layer chromatographic separation is used. Due to the substance involved, it is necessary to evaluate via nonlinear calibration function (parabola compensation). The equipment combination utilized is a DC scanner together with an integrator. Through on-line counting to a programmable electronic table-top computer higher accuracy and time-saving are achieved due to the possibility of scanning both in the development direction of the DC plate and against it and to the ensuing background correction. The error of the method is about 1.5%.

74-2012. Magallona, E. D. (Univ. California, Riverside, CA 92502). ***N*-derivatization for the gas chromatographic detection of insecticidal aryl *N*-methylcarbamates.** *Diss. Abstr. Int. 34(10): 5004B; 1974.*

The *N*-acetyl-(Cl)*x* derivatives of carbaryl were readily prepared from the pyridine-catalyzed reactions of the acid chlorides or of trichloroacetic anhydride for *N*-trichloroacetyl carbaryl. These reactions followed pseudo-first-order kinetics and the formation of 1-naphthol esters as cleavage products was negligible. *N*-Trichloroacetyl and *N*-nitroso carbaryl underwent extensive thermal decomposition in the gas chromatographic system so that their theoretical advantages for carbaryl analysis were not realized. These compounds were also subject to hydrolysis on exposure to traces of atmospheric moisture. Although the *N*-monochloroacetyl and *N*-dichloroacetyl derivatives were also subject to thermal decomposition, they gave sufficient linearity and sensitivity with the microcoulometric detector for analysis at the residue level. *N*-Acetyl carbaryl was thermally stable and the response by the electrical conductivity and electron-capture detectors was adequate for residue analysis. Acetylated 5-hydroxy carbaryl showed minimal thermal decomposition on an SE-30 column using the electrolytic conductivity detector but electron-capture detector response was low. The monochloroacetyl derivative of 5-hydroxy carbaryl underwent thermal decomposition and could not be detected with the specific detectors. Very low response was obtained with the electron-capture detector. At the residue level, *N*-acetyl carbaryl was readily prepared through the sulfuric acid-catalyzed reaction with acetic anhydride, the reaction being complete in five minutes at 100°C. No interferences were observed on quantitation with the electrolytic conductivity and electron-capture detectors. Direct quantitation of the pyridine-catalyzed *N*-monochloroacetylation and *N*-dichloroacetylation reactions was not possible with the microcoulometric and electron-capture detectors because of interferences but was possible with the electrolytic conductivity detector. After two hours at 100°C, *N*-monochloroacetylation was complete but about five percent carbaryl still remained in the *N*-dichloroacetylation reaction. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-9252.)

74-2013. Beyermann, K.; Eckrich, W. (Inst. fuer anorganische Chemie und analytische Chemie der Univ. Mainz, Mainz, Germany). **Trennung des Insecticidgehaltes der Luft in den Aerosol-gebundenen und den gasfoermigen Anteil. [Differentiation of the aerosol-bound and gaseous fractions of insecticides in air.]** *Fresenius Z. Anal. Chem. 269(4): 279-284; 1974.* (3 references) (German)

To differentiate the fraction of pesticides that is adsorbed to dust particles from the fraction that is vaporized air samples are filtered by means of glass fiber filters. The air passing through these filters contains the vaporized insecticides. To collect this fraction the air is passed over stainless steel nets which are covered with polyethylene glycol 400. Nets prepared in such a way can also be used to collect both aerosol bound and free insecticides from air. By investigation of about 15 samples of air it could be demonstrated that the fraction of vaporized insecticides is several times greater than the fraction bound to dust particles. (Author abstract by permission)

74-2014. Irving, H. (School of Chemistry, Univ. of Leeds, Leeds, England). **Separation and preconcentration.** *Fresenius Z. Anal. Chem. 263(4): 264-271; 1973.* (62 references)

Separation and preconcentration methods are reviewed. Among the procedures, chromatography and ion exchange are discussed in particular detail as separation methods, and absorption and extraction as preconcentration methods. Preconcentration may be carried out independently of separation, or the two processes may be interdependent. Preconcentration may involve collection of minor components or removal of major components. Separation methods exploit differences in chemical or physical properties of the desired and undesired components. Liquid-liquid extraction, taking advantage of partitioning coefficients between two immiscible phases, has been widely employed to concentrate organic compounds such as pesticides present at trace levels in aqueous systems. Substances to be analyzed may be treated to increase their volatility, thus making them more amenable to gas chromatography. Silylation is one such treatment method which has been used in pesticide analysis. Forced-flow liquid column chromatography has been used for rapid separation of substituted urea herbicides (monuron, diuron, fenuron, and neburon).

74-2015. Seifert, J.; Davidek, J. (Dept. of Food Chem. and Analysis, Technical Univ., Prague, Czechoslovakia). **One step determination of concentration and anticholinesterase efficiency of fenitrothion.** *Fresenius Z. Anal. Chem. 269(5): 357-359; 1974.* (9 references)

A polarographic method is described for the determination of actual concentration and inhibition efficiency of fenitrothion, as well as for the concentration of its hydrolytic product 3-methyl-4-nitrophenol, in a single operation. The method is based on the polarographic determination of fenitrothion and enzymatic polarographic determination of the inhibition efficiency toward the serum esterases. The method can be applied to the determination of the purity of fenitrothion, for the study of kinetics of its hydrolysis and for the screening analysis of anticholinesterase impurities in this insecticide. (Author abstract by permission)

74-2016. Niederschulte, U.; Ballschmiter, K. (Abt. Anal. Chemie, Univ. Ulm, B-7900 Ulm, Oberer Eselsberg, Germany). **Isolierung und Anreicherung von Chlorphenoxyessigsaeuren aus Wasser mit makroretikulaeren Adsorberharzen XAD-2 and XAD-7. [Isolation and preconcentration of chlorophenoxy acetic acids from water with macroreticular resins XAD-2 and XAD-7.]** *Fresenius Z. Anal. Chem. 269(5): 360-363; 1974.* (12 references) (German)

Herbicide chlorophenoxy acetic acids can be isolated by the macroreticular adsorbing resins Dowex Amberlite XAD-2, XAD-4, XAD-7, and XAD-8. The adsorption of phenoxy acetic acids reaches an optimum at pH 2 and flow rates of about 5 bed-volumes per minute. Elution depends on the polarity and contact time of the eluent. A quantitative isolation of chlorophenoxy acids in the 25 ppb range in water can be achieved by adsorption on the divinylstyrol resin XAD-2 following elution with acetone. Further concentration of the eluate is possible by standard methods. (Author abstract by permission)

74-2017. Nierle, W. (Author address not given). **Beitrag zur Analytik von CCC-Rueckstaenden in Weizen. [Analysis of CCC residues in wheat.]** *Getreide Mehl 27(2): 48-51; 1973.* (9 references) (German)

A preparative and quantitative analytical method for the determination of CCC (chlormequat chloride) residues in wheat is described. Following grinding and extraction with methanol, the evaporated extract is treated with a mixture of carbon tetrachloride and hydrochloric acid. After neutralization with anion exchanger, the evaporated and methanol-dissolved extract is dialyzed against distilled water for the retention of high-molecular substances; CCC, choline, and other substances are transferred quantitatively in the aqueous phase. Choline and CCC are then separated from the bulk of pigments and non-ionogenic contaminants on a cation exchanger column. The substances yet present in the eluate from the exchanger are separated from CCC on an alumina column. The separation of CCC and choline is possible on cellulose plates using *n*-butanol-ethanol-acetic acid-water as solvent system. The CCC-containing layer is quantitatively removed and extracted with methanol. The extract is determined colorimetrically by means of dipicryl reagent in the usual manner.

74-2018. Parslow, R. (British Sugar Corp., Ltd., Res. Labs., Colney, Norwich, Great Britain). **Methods of residue determination at British Sugar Corporation Research Laboratories.** *IIRB (Inst. Ind. Rech. Betteravieres) 6(3): 138-153; 1973.* (11 references)

Methods found convenient and reliable for the determination of residues in sugar, sugar beet leaf and root materials, and beet products are described. Temik (aldicarb), together with its major toxic and nontoxic metabolites, is determined by solvent extraction, followed by solvent partition and coagulation clean-up procedures. After basic and acidic hydrolysis, the released hydroxylamine is determined colorimetrically. Determination of the other residues involves the use of electron capture gas-liquid chromatography (GLC). Dalapon is extracted as the free acid with aqueous phosphoric and phosphotungstic acids, and partitioned into diethyl ether. 'D-D' residues are extracted by a continuous solvent extraction/steam distillation procedure. A special apparatus designed to ensure efficient extraction with minimal solvent is used, since the volatility of 'D-D' precludes subsequent solvent evaporation. Trifluralin and organochlorine insecticide residue determinations involve the use of solvent extraction, solvent partition, and Florisil column chromatographic procedures. Precautions required to avoid residue loss and the introduction of extraneous materials which might interfere with GLC peaks are described. Recoveries and detection limits are given for all methods, and typical chromatograms are illustrated.

74-2019. Saha, N. C.; Mitra, G. D. (Sindri, India). **Gas chromatography—a unique choice in the analysis of pesticide residue.** *Indian Sci. Congr. Ass. Proc. 59(3): 158; 1972.*

Gas chromatography can offer the most efficient and complete technique currently available for the analysis of pesticide residues in agricultural products. Elution and separation power can be increased several fold by high-performance columns, such as very lightly loaded columns on ideally inert support of optimum pore specifications. The identification of separated peaks can be improved by: the application of newer parameters derived from extended concepts of retention index; derivative gas chromatography; the use of multiple detectors with effluent splitters; the simplification of clean-up by preparative gas chromatographic and subtraction columns; and the combination of gas chromatography with mass and infrared spectrometers.

74-2020. Purkayastha, R. (Chem. Biol. Res. Inst. Res. Branch, Canada Dept. Agr., Ottawa, Ontario K1A OC6, Canada). **Simultaneous determination of 2,4-dichlorophenoxyacetic acid, 2,4,5-trichlorophenoxyacetic acid, and 2-methoxy-3,5-dichlorobenzoic acid in soil and water by gas chromatography with electron capture detector.** *J. Agr. Food Chem. 22(3): 453-458; 1974.* (4 references)

Factors such as extraction, esterification, cleanup, stationary phases, and ^{63}Ni detector response were examined and a sensitive method using diethyl ether extraction, *n*-butylation, and Florisil cleanup was developed for the simultaneous detection and determination by gas chromatography of low levels of plant-growth regulating herbicides 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), and 2-methyl-3,6-dichlorobenzoic acid (dicamba) in soil and water. The method is satisfactory with respect to background interference, resolution, and sensitivity using an OV-17/QF-1 or Carbowax 20M column. The soil background varied according to the type of soil, extraction method, esterification, cleanup, and GC conditions used. 2,4-D and 2,4,5-T exhibited good recovery from fortified soil samples using both methylation and *n*-butylation, whereas dicamba gave variable recovery with methylation but good recovery with *n*-butylation. Data on retention times and responses of the herbicide esters have been presented. The sensitivities (50% full scale values) of the compounds were in the subnanogram to low nanogram range. The sensitivity of the method is generally 0.03-0.05 ppm in soil. Water samples can be analyzed without cleanup. (Author abstract reprinted by permission of the American Chemical Society)

74-2021. Sharp, C. W.; Lores, E. M., Jr. (Pathol. Physiol. Branch, Nat. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Chromatographic parameters of the bisquaternary herbicides, paraquat and diquat.** *J. Agr. Food Chem. 22(3): 458-461; 1974.* (16 references)

Analysis of bisquaternary amines by thin layer chromatography represents a special problem. The diacetate, dichloride, and (mixed) acetate-chloride salts are resolved following development with a solvent composed of *n*-butyl alcohol, acetic acid, and water. Formation of the acetate salts could be suppressed by the addition of chloride ions to the system. However, from among several systems examined, solvents containing benzene-*n*-pentyl alcohol-methanol–1 *N* HCl, either 1:1:2:1 or 1.3:4:8:8, in combination with 300 MN cellulose thin layers are particularly suitable for the chromatography of paraquat, diquat, and perhaps other bisquaternary amines. This permitted the resolution of paraquat from diquat, as well as from impurities present in the technical grade of paraquat. (Author abstract reprinted by permission of the American Chemical Society)

74-2022. Mendoza, C. E.; Shields, J. B. (Biochem. Dept., Arrhenius Lab., Stockholm Univ., Fack, S-104 05 Stockholm, Sweden). **A microcolumn apparatus for rapid cleanup of 2,4-dinitrophenylmethylamine extracts**

for carbamate pesticide analysis. *J. Agr. Food Chem. 22(3): 528-530; 1974.* (7 references)

A microcolumn apparatus has been devised and tested for cleanup of the reaction product of methomyl (an *N*-methyl carbamate insecticide) and 1-fluoro-2,4-dinitrobenzene before gas chromatography. Microcolumns packed with silica gel G-HR gave consistently good cleanup and quantitative recovery of 2,4-dinitrophenylmethylamine. Details of the apparatus and the cleanup procedure are described. (Author abstract reprinted by permission of the American Chemical Society)

74-2023. Roberts, R. L.; Blackmer, G. L.* (Dept. Chem., Texas Tech. Univ., Lubbock, TX 79409). **Carbon-13 Fourier transform nuclear magnetic resonance with Eu(fod)$_3$ for configurational confirmation of polychlorinated pesticides, endrin and dieldrin.** *J. Agr. Food Chem. 22(3): 542-545; 1974.* (15 references)

The structures of endrin, hexachloroepoxyoctahydro-*endo,endo*-dimethanonaphthalene, and dieldrin, hexachloroepoxyoctahydro-*endo, exo*-dimethanonaphthalene, widely used chlorinated pesticides, were confirmed by natural abundance carbon-13 Fourier transform NMR. Configurational confirmation was accomplished with the aid of a paramagnetic chemical-shift reagent tris(1,1,1,2,2,3,3-heptafluoro-7,7-dimethyl-4,6-octanedionato)europium(III), Eu(fod)$_3$. Assignments were confirmed on the basis of the magnitudes of the chemically induced shifts, the carbon-13 proton coupling constants, and nuclear Overhauser enhancements (NOE). The loss of NOE, observed in the carbon-13 spectra upon successive additions of the chemical-shift reagent, was cited as a diagnostic for making structural assignments. The marked advantages offered by these techniques over existing methods, for pesticide chemistry, are discussed and information regarding the point of attachment of shift reagents to such substrates is observed. (Author abstract reprinted by permission of the American Chemical Society)

74-2024. Buser, H. R.; Bosshardt, H. P. (Swiss Fed. Res. Sta. Arboricult., Viticult., Horticult., CH-8820 Waedenswil, Switzerland). **Determination of 2,3,7,8-tetrachlorodibenzo-1,4-dioxin at parts per billion levels in technical-grade 2,4,5-trichlorophenoxyacetic acid, in 2,4,5-T alkyl ester and 2,4,5-T amine salt herbicide formulations by quadrupole mass fragmentography.** *J. Chromatogr. 90(1): 71-77; 1974.* (19 references)

A fast, highly selective gas chromatographic method was developed for the determination of 2,3,7,8-tetrachlorodibenzo-1,4-dioxin (TCDD) in technical 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and also in 2,4,5-T alkyl ester and amine salt herbicide formulations using quadrupole mass fragmentography. The method is faster, more sensitive and has a higher specificity than previously reported methods using conventional gas chromatography. It requires minimal or no sample clean-up. The content of TCDD found in batches of 2,4,5-T produced from 1967 to 1973 by one manufacturer showed a sharp decrease after 1970 from 500 to 50 ppb. (Author abstract by permission)

74-2025. Kawano, Y.; Yanagihara, K. H.; Bevenue, A. (Univ. Hawaii, Honolulu, HI 96822). **Analytical studies of pyrethrin formulations by gas chromatography. III. Analytical results on insecticidally active components of pyrethrins from various world sources.** *J. Chromatogr. 90(1): 119-128; 1974.* (24 references)

Gas chromatographic techniques were applied to studies of the insecticidally active esters of pyrethrum. Pyrethrin extracts from various world sources were compared. The greater potential importance of more definitive and precise results acquired by gas chromatography compared with results obtained by older classical procedures is illustrated and it is more evident when comparisons are made of the true pyrethrin I and pyrethrin II ester fractions of the extracts. Results of this more precise nature should be of increased benefit to the pesticide formulator and to the insect toxicologist. (Author abstract by permission)

74-2026. Balayannis, P. G. (State Drug Control Lab.–KEEF, Dept. Pesticides, Athens, Greece). **Preparation and use of surface-modified adsorbents in clean-up techniques for pesticide residue analysis.** *J. Chromatogr. 90(1): 198-202; 1974.* (2 references)

Chromatographic techniques used for the cleanup of extracts prior to pesticide analysis have generally produced incomplete separations. To improve the resolving power of the adsorbents, aliphatic chains were attached at the adsorption sites. Alumina and silica gel were treated with a solution of octadecyltrichlorosilane or dimethyldichlorosilane, then the dried, modified powder purged with hot, moist air. The modified adsorbents were packed in chromatographic columns and tested for cleanup of a tomato extract spiked with DDT, DDE, and lindane. The pesticides and impurities were separated according to their affinity for the modified material, not on the basis of polarity. The functional mechanism of the modified columns is not yet understood. The treated adsorbents may be more useful with TLC than with GLC detection. Their principal advantage is the number of parameters that can be changed in order to improve the resolution.

74-2027. Koudela, S.; Cieleszky, V. (Inst. of Nutr., Dep. of Toxicol. Chem., Budapest, Hungary). **Determination and micro-preparative separation of chlorocholine chloride by paper chromatography.** *J. Chromatogr. 90(1): 233-235; 1974.* (11 references)

Chromatographic or spectrophotometric determination of CCC (chlormequat chloride) requires effective

separation from choline and other compounds. In experiments using various combinations of solvent systems on buffered and salt-impregnated papers, optimum separation was achieved on filter paper impregnated with 3% sodium chloride, developed with the supernatant of the mixture isoamyl alcohol-*n*-propanol-3% NaCl solution (1:2:3). When the sodium chloride concentration was reduced, the CCC and choline spots became more satisfactorily resolved but also more diffuse. The procedure permitted complete separation of CCC from choline, even when choline was present in 1000-fold excess. CCC can be easily detected in the 2-500 μg range. When paper chromatography is used as a preparative separating technique and CCC is extracted from the paper and determined spectrophotometrically as the dipicrylamine complex, the detection limit for a 50-g sample is 0.05 ppm.

74-2028. Tirosh, N.; Siegmann, A.; Narkis, M. (Plastics Inst., Cent. Ind. Res., Haifa, Israel). **Pesticides: recovery from plasticized PVC and analysis by GLC.** *J. Chromatogr. Sci. 12(3): 149-151; 1974.*

A method is described for separating pesticides from plasticized PVC mixtures and for analyzing them quantitatively. Samples of plasticized PVC containing dimethyl phthalate (DMP) or *N,N*-diethyl-*m*-toluamide (DEET) were weighed into a glass stoppered bottle to which a measured volume of THF was added. The sample was dissolved by shaking the mixture at room temperature overnight. The PVC was then precipitated from the clear solution by adding a measured volume of methanol. An aliquot from the supernatant solvent mixture containing the pesticide and the plasticizer was then analyzed by gas chromatograph. The method was also applied to the analysis of plasticized PVC containing 1,2-dibromo-3-chloropropane (DBCP) and *O,O*-dimethyl-*O*-2,2-dichlorovinyl phosphate (dichlorvos); it can be applied to other pesticides or their mixtures.

74-2029. Bernatskaya, L. S. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Opredeleniye gerbana v vode, pochve i rastitel'nykh probakh. [Determination of herban (norea) in water, soil, and plant samples.]** *Khim. Sel. Khoz. 12(1): 63-64; 1974.* (Russian)

A combined thin-layer chromatographic and colorimetric method for the determination of herban (norea) in water, soil, and plant samples is described. Extraction from water is done with chloroform; hexane is used for herban extraction from soil and plant samples. The extract is applied on a chromatographic layer and treated with 8:1 ratio of chloroform and acetone. The spot is irradiated for photochemical decompositon of herban, and the decay products are chlorinated with 10% solution of hydrochloric acid with potassium permanganate. The chromatographic layer is then sprayed with a visualizing agent composed of glacial acetic acid and *o*-toluidine to obtain a spot of grayish-blue color. The sensitivity of the method amounts to 0.025 mg/liter in water and 0.05-0.1 mg/kg in soil and plant samples. The recovery rates are 90-100% for water and 70-80% in soil and plant samples.

74-2030. Watanabe, S. (Watanabe Internal Medical Hospital, Itayanagi-cho, Aomori, Japan). **[The detection of organic phosphorus from pesticides in the serum of the patient who is suspected to be chronically intoxicated by organophosphorus pesticide, and its meaning.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 23(1): 42-50; 1974.* (28 references) (Japanese)

The sera of 15 patients with pesticide application history of more than 15 years and who had symptoms diagnosed as chronic intoxication by organophosphorus pesticides were analyzed. Parathion, diazinon, EPN, malathion, fenitrothion, and salithion, respectively or in combination, could be detected by extracting serum three times with *n*-hexane, column-chromatographing the extract on Florisil with a mixture of *n*-hexane and ethyl ether (94:6), then subjecting it to gas chromatography. The percent recovery of the system on ethyl parathion, fenitrothion, malathion, diazinon, salithion, and EPN was respectively 90.5, 94.6, 91.1, 95,6, 91.0, and 88. The limit of detection of fenitrothion, ethyl parathion and malathion in human serum was respectively 1.4×10^{-3}, 1.2×10^{-3} and 4.5×10^{-3} ppm (FTD), and 2.4×10^{-4}, 5.6×10^{-5} and 2.8×10^{-4} ppm (FPD). The identification was carried out using retention times of specific peaks. Cases are described with case history given and in which the detected organophosphorus compounds and their concentration in serum were 0.0613 ppm parathion, 0.1239 ppm diazinon, 0.0104 ppm EPN, 0.007 ppm malathion, 0.0239 ppm fenitrothion, and 0.0068 ppm salithion. The significance of these findings must be carefully considered. The possibility of individual differences of detoxication in the body and the probability of contamination from foods are discussed.

74-2031. Mestres, R. (Lab. de Chimie Appliquee a l'Expertise, Fac. de Pharmacie, Montpellier, France). **Nature des pesticides utilises dans la culture des plantes oleagineuses. Dosage des pesticides ou de leurs metabolites dans les corps gras. [Nature of pesticides used in growing oil-crop plants. Determination of pesticides or their metabolites in fats.]** *Rev. Fr. Corps Gras 21(3): 145-153; 1974.* (39 references) (French)

A brief description is given of the pesticides primarily used for oil-crop plants, and procedures for the extraction, cleanup, and determination of pesticides residues in oils are presented. Lindane, BHC, methoxychlor, dicofol, chlorobenzilate, DMC, chlordane, heptachlor, aldrin, dieldrin, dimethoate, parathion, malathion, diazinon, trichlorfon, and phosphamidon are pesticides commonly used in oil-crop cultures. Total extraction by means of hexane and selective extraction by means of

acetonitrile, methanol, or water-diluted acetone are available for the extraction of pesticide residues from oils. Further purification and separation is possible by extractive distillation, possibly in the presence of dilute glycerine, a method especially suitable for trichlorfon and molinate; vacuum distillation is used for DDT and parathion; forced distillation, removed by cleanup on chromatographic column, solvent phase separation, and saponification are also used; the latter are especially suitable for the determination of dieldrin, endrin, and PCBs. The pesticide residue levels in the purified samples are determined by gas chromatography.

74-2032. De Vos, R. H. (Cent. Inst. Nutr. Food Res. TNO, Zeist, The Netherlands). **Analytical techniques in relation to the contamination of the fauna.** *TNO-Nieuws 27(10): 615-622; 1972.* (36 references)

A brief, general description of analytical methodology used and a brief outline of techniques currently employed for analysis of organochlorines, polychlorinated biphenyls (PCBs), organophosphates, and mercury in wildlife samples are reported. Quantitative determination of organochlorines and PCBs is generally accomplished by electron capture-GLC of samples that have been cleaned up by solvent partitioning and/or column chromatography. MS is valuable for confirmation of results obtained by GLC. GC also has application in analysis of organophosphates, but TLC and spectrophotometric procedures and measurement of ChE inhibition are widely used. Neutron activation analysis was the method of choice for most of the work on mercury in the other papers in the issue.

74-2033. Hahn, V.; Hoehne, W. E.; Uhlig, H. J. (Institut fuer Physiologische und Biologische Chemie, Humboldt-Universitaet Berlin, Berlin, DDR). **Neue Trends in der klinisch-chemischen und biochemischen enzymatischen Analytik. [New trends in clinical chemical and biochemical enzyme analysis.]** *Z. Med. Labortech. 14: 67-97; 1973.* (115 references) (German)

New trends in the clinical chemistry and biochemistry of enzymatic analyses are surveyed. Current developments feature trends toward greater sensitivity by means of fluorimetric and cyclization techniques, increased selectivity, material economization by the use of carrier-bound enzymes and enzyme electrodes, facilitation of automation by means of fixed-volume systems, use of continuous flow or rotation systems, application of computer-assisted analysis, and miniaturization and simplification of tests for screening purposes. There is a definite tendency to combine multi-component analysis with computer evaluation. Methods for identification of pesticide and herbicide residues and new, selective, high-sensitivity enzymatic methods using enzymes and enzyme inhibitors other than cholinesterase based systems have been developed. Aldrin and heptachlor concentrations in a range of 1-100 μg/liter can be determined by alkaline phosphatase inhibition tests, while acid phosphatases are used for detection of parathion in a concentration range of 10-500 μg/liter, even in the presence of other pesticides. Lipase tests are suitable for determining carbaryl and aldrin at 0.1-20 μg/liter, heptachlor at 0.5-100 μg/liter, lindane at 0.8-100 μg/liter, and DDT and 2,4-D at 10-1.000 μg/liter. A new selective method has been found for the detection of DDT with carbonic anhydrase; the sensitivity is 10 μg.

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